VOLUME LI NUMBER FIVE

THE NATIONAL GEOGRAPHIC MAGAZINE

MAY, 1927

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Wild Flowers of the West
With 206 Illustrations in Full Color — EDITH S. CLEMENTS

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ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

TO carry out the purposes for which it was founded thirty-nine years ago, the National Geographic Society publishes this Magazine. All receipts are invested in the Magazine itself or expended directly to promote geographic knowledge.

ARTICLES and photographs are desired. For material which the Magazine can use, generous remuneration is made. Contributions should be accompanied by an addressed return envelope and postage.

IMMEDIATELY after the terrific eruption of the world's largest crater, Mt. Katmai, in Alaska, a National Geographic Society expedition was sent to make observations of this remarkable phenomenon. Four expeditions have followed and the extraordinary scientific data resulting given to the world. In this vicinity an eighth wonder of the world was discovered and explored—"The Valley of Ten Thousand Smokes," a vast area of steaming, spouting fissures. As a result of The Society's discoveries this area has been created a National Monument by proclamation of the President of the United States.

AT an expense of over $50,000 The Society sent a notable series of expeditions into Peru to investigate the traces of the Inca race. Their discoveries form a large share of our knowledge of a civilization waning when Pizarro first set foot in Peru.

THE Society also had the honor of subscribing a substantial sum to the expedition of Admiral Peary, who discovered the North Pole.

NOT long ago The Society granted $25,000, and in addition $75,000 was given by individual members to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees of California were thereby saved for the American people.

THE Society is conducting extensive explorations and excavations in northwestern New Mexico, which was one of the most densely populated areas in North America before Columbus came, a region where prehistoric peoples lived in vast communal dwellings and whose customs, ceremonies, and name have been engulfed in an oblivion.

TO further the important study of solar radiation in relation to long-range weather forecasting, The Society has appropriated $60,000 to enable the Smithsonian Institution to establish a station for four years on Mt. Brukkaros, in Southwest Africa.

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For Graduation give an Accurate Watch

There is one gift of which every graduate is most justly proud —a handsome watch.

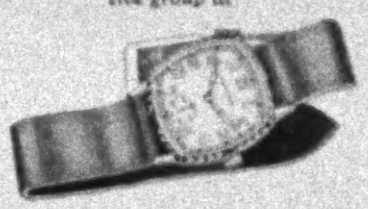
IN a fine watch, accuracy is the prime requisite; it is the supreme achievement of the watchmaker's art. It is the outstanding quality of the Hamilton, the quality which has won for it the name—"The Watch of Railroad Accuracy." It is, in fact, so accurate that it is the choice of most of the men who run America's fastest trains. And in a watch there can be no substitute for accuracy.

The Hamilton has an inherent dependability. Year after year, it gives reliable service. Each part is fashioned to the minutest precision. There is exactitude and perfection of finish—there are weeks of skillful and patient testing. Almost a year is required to make a Hamilton, so carefully is it made and adjusted.

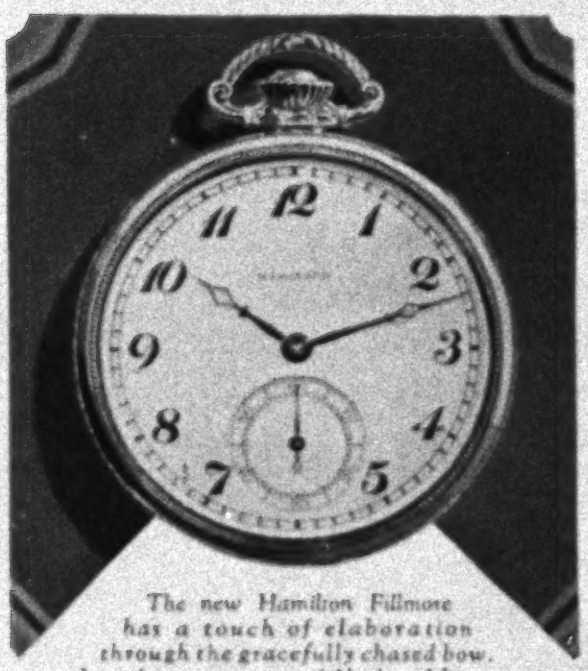
This smart new Hamilton model with its rigid bow reflects the latest style touch in case design. Green or white filled gold with 17-jewel movement, $50.

Hamilton offers a splendid selection of 17-jewel thin models in cases of white or green filled gold, plain or chased. The prices range from $48 to $57, with a particularly attractive group at

$50



Hamilton Engraved Cushion-shaped Strap Watch—in green or white filled gold, $52 or in 14-carat gold, $77.

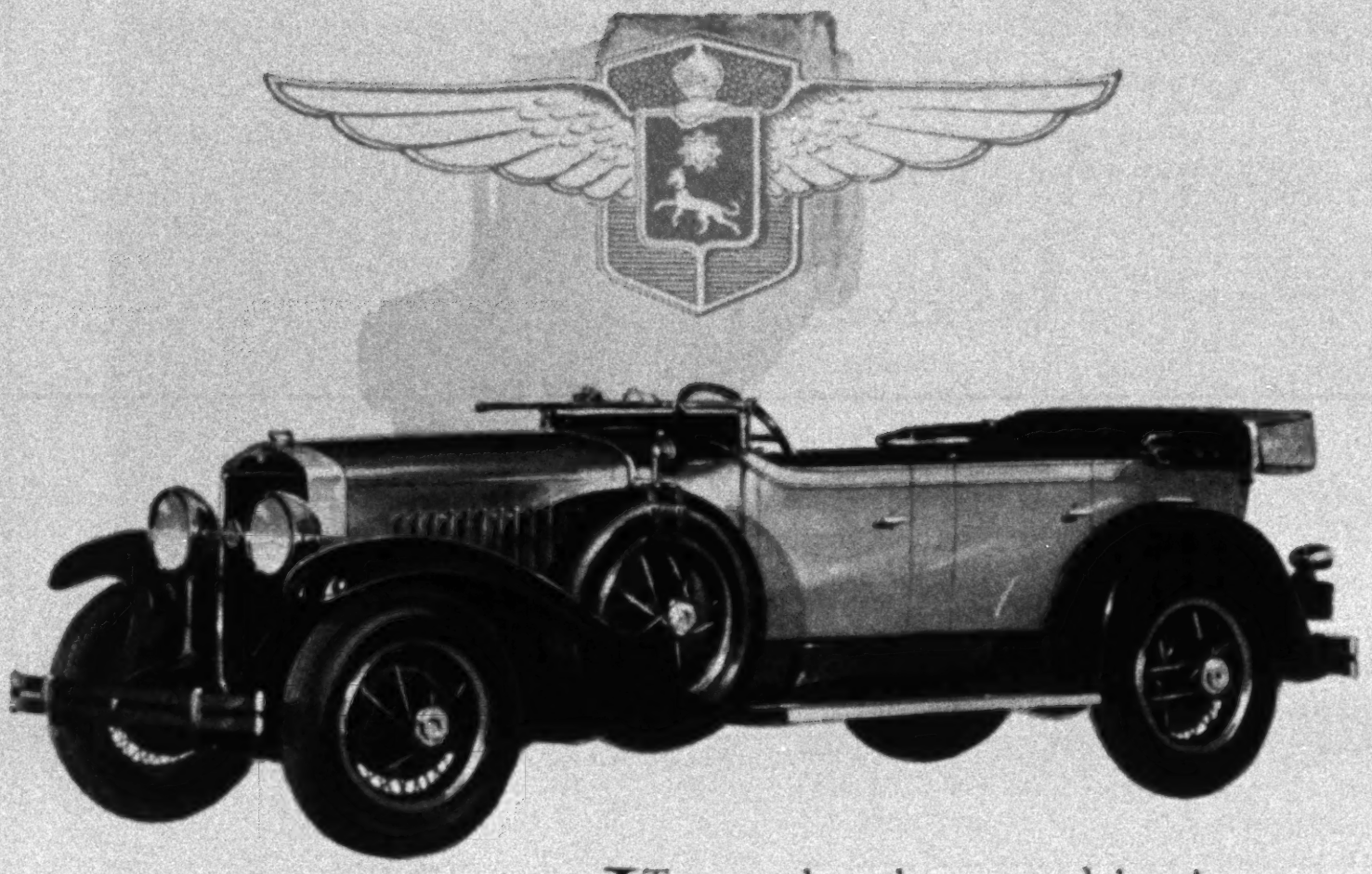


The new Hamilton Fillmore has a touch of elaboration through the gracefully chased bow. In white or green filled gold case with 17-jewel movement . . . . . $50.

Hamiltons are $48 to $685. There is a fine variety of styles around $50 that are popular for graduation gifts. Ask your jeweler. Let us send you our two booklets, "The Timekeeper" and "The Care of Your Watch." Address Hamilton Watch Company, 882 Columbia Avenue, Lancaster, Pa., U. S. A.

Hamilton Watch

The Watch of Railroad Accuracy



Manufactured completely by the Cadillac Motor Car Company within its own plants.

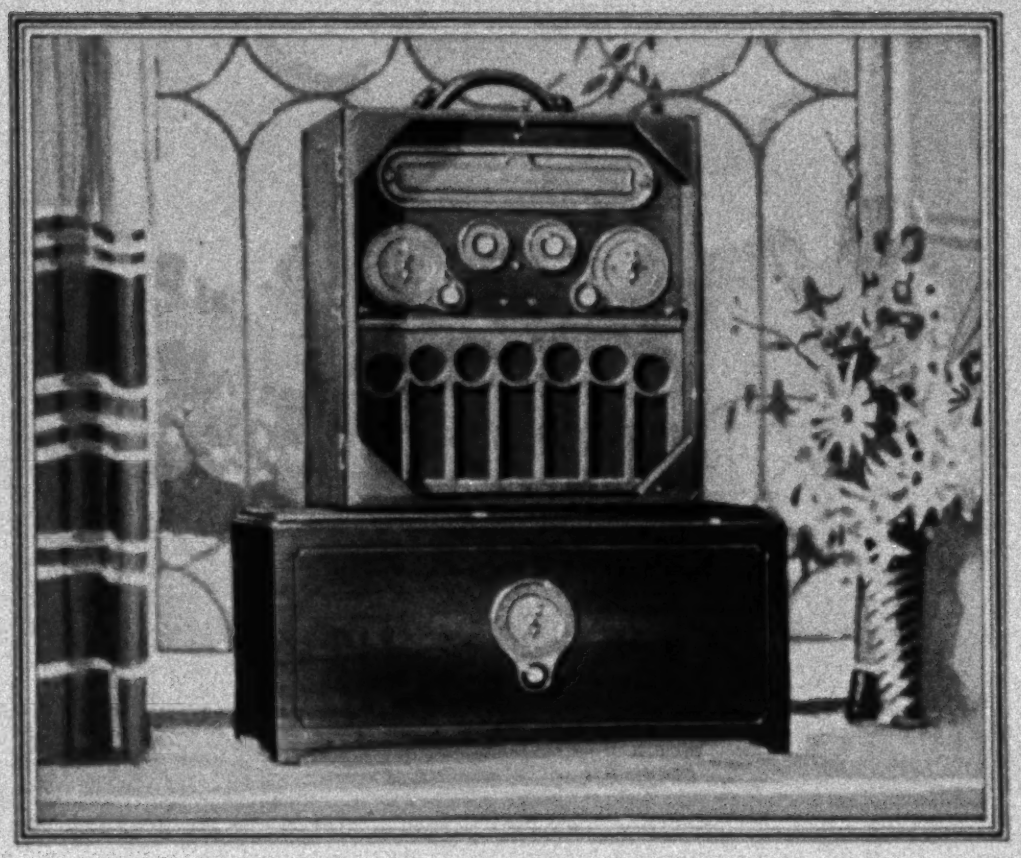
IT was only to be expected that America, with its quick and wholehearted appreciation of superiority in any field, should have accorded a warm welcome to the LaSalle. For it is obvious that, in this blood-brother to Cadillac, the incomparable engineering and manufacturing supremacy which alone could create a car worthy of Cadillac traditions, has achieved a new and signal triumph. In rare beauty, in brilliance of performance, in certainty of distinguished and dependable service, the LaSalle gives fine and complete expression to the Cadillac practice and the Cadillac idealism which produced it.

CADILLAC MOTOR CAR COMPANY

Detroit, Michigan *Oshawa, Canada*

Division of General Motors Corporation

LaSalle



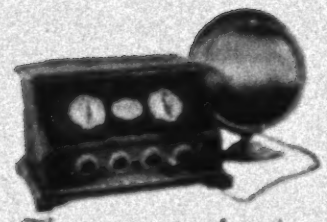
Portable superheterodyne

A six-tube superheterodyne, encased in a handsome walnut cabinet that cleverly fills a double purpose—in the living room or in camp or shack or on the beach.

Radiola 26, with 6 Radiotrons. $225

Leaders in their respective fields

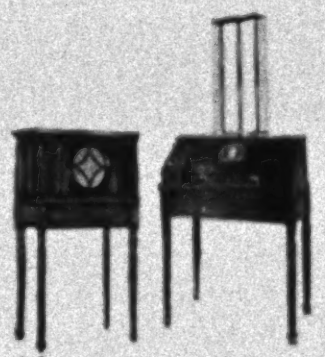
Buy any one of the Radiolas shown here and you will be sure of pure and reliable reception. Every Radiola —lower priced as well as higher— embodies the skill of the engineers of Radio Corporation of America, Westinghouse and General Electric who built these supreme receiving sets as well as the world's leading broadcasting stations. Go to any RCA Authorized Dealer today and ask him to demonstrate the Radiola. Then you will know why more Radiolas are in use than any other make of set.



The greatest value *in radio today*

New principles make this set many times as selective as the ordinary antenna set. Unequalled in steady performance at anywhere near its price. May be operated with batteries or from lighting socket devices.

Radiola 20, less equipment . . $78
RCA Loudspeaker 100. $55



The supreme electrical and musical achievement of 1927 radio

This combination of eight-tube super-heterodyne and power speaker not only does away with antenna and batteries but sets a new standard of musical realism.

Radiola 28, with 8 Radiotrons . $260
RCA Loudspeaker 104, complete $275
A. C. Package for adapting Radiola 28 with RCA Loudspeaker 104 on 50-60 cycle, 110 volt A. C. lighting circuit $35

Buy with confidence where you see the sign

Authorized Dealer RCA

RADIO CORPORATION OF AMERICA

RCA-Radiola

MADE BY THE MAKERS OF THE RADIOTRON

NEW YORK CHICAGO SAN FRANCISCO

LINCOLN

The Lincoln on the Boulevards of the World
Michigan Ave. Chicago

The Lincoln Four-Passenger Coupe

¶ A careful analysis of costs, covering the entire life of the car, would prove the Lincoln one of the most economical cars to own and operate. ¶ Chassis, motor and body are so soundly built that the car is capable of many years of uninterrupted service. Johansson precision standards are scrupulously observed throughout Lincoln workmanship and absolute control of the quality of materials is assured by Ford ownership of sources of supply. ¶ The Lincoln owner finds that the cost per mile of usage becomes lower and lower as the years go by, yet his enthusiasm for the car's splendid performance never wanes.

A six-brake system is now standard on Lincoln cars

LINCOLN MOTOR COMPANY
Division of Ford Motor Company

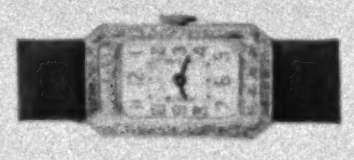
SAY IT FOR A LIFETIME . . . WITH AN ELGIN

MAKE EVERY DAY "MOTHER'S DAY"

IN THE SERVICE OF YOUR GIFT

Any gift is a thrilling gift to mother . . . if it comes on the wings of your devotion. But why not an Elgin Watch . . . as your message to mother on Mother's Day this year? Imagine her gaiety when she slips on that exquisite, ultra thin Elgin Wrist Watch, a tiny poem in white gold or platinum. And imagine your satisfaction . . . when you reflect that her Elgin will deliver to her ceaselessly, through its service and its beauty, that message of everlasting devotion which . . . all too often . . . you forget to send.

ELGIN



THE WATCH WORD FOR ELEGANCE AND EFFICIENCY

THE WRIST WATCH, *above*, is encased in 18-karat solid white gold, set with diamonds, and priced at $150.

THE WRIST WATCH, *at the right*, in a case of 14-karat solid white gold, is priced at $60.

Your jeweler will show these and other Elgins to you gladly. No other watch is offered in so generous an assortment of styles nor at a price range so liberal.

© Elgin, 1927

Flat, center-traction Tread
-quick grip-quick release-
4 POINT CONTACT
NO SLIPPING, SKIDDING OR SHIMMYING
with the Dayton Stabilized Balloon

THE same engineers and chemists who produced the Dayton Thorobred Cord—*the pioneer low air pressure tire*—have developed another outstanding advancement—the Dayton *Stabilized* Balloon. It marks a revolutionary forward step in tire construction and design.

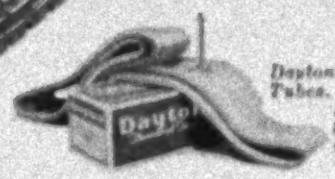
Stabilized construction absorbs road shocks and distributes wear evenly. Flat, center-traction tread has complete four-point road contact. No singing, no rumbling. Quick-grip, quick-release, non-skid give lightning "get-away" and perfect safety at all speeds. Stabilizing bands of friction rubber draw the center of tread parallel to center of rim, thus preventing "shimmying." The rubber is especially compounded and tempered—by an *exclusive* Dayton process. It is strong and durable—and will outlast extra thousand of miles of toughest driving.

Every one who has ever used Dayton Stabilized Balloons will tell you of a new tire experience that will amaze you. Why not go to the Dayton dealer and personally examine this incomparable tire?

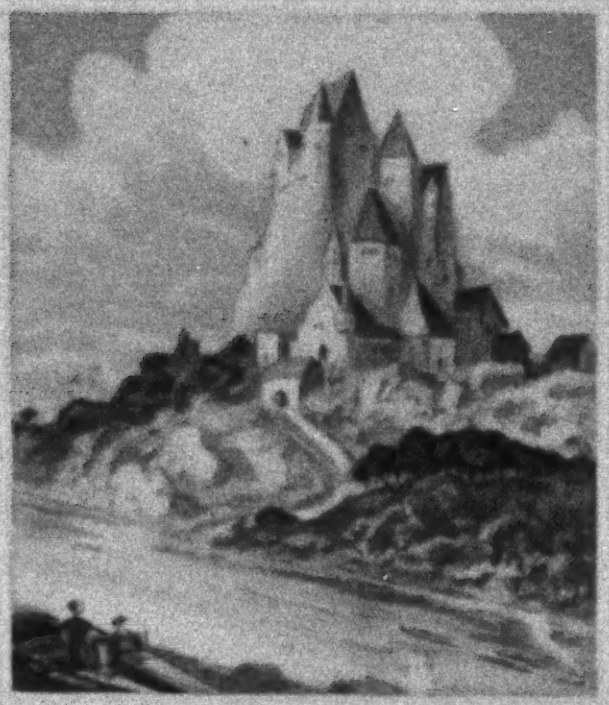
The DAYTON RUBBER MFG. CO., Dayton, Ohio

Dayton STABILIZED BALLOONS

ON WHEELS OF LARGE DIAMETER—install Dayton Thorobred Cords—superlative tire values that smash all mileage records. The Dayton Thorobred is *the pioneer low air pressure tire*—the first to combine comfort with safety and endurance.



Dayton Thorobred Extra-heavy Tubes. Grey—of finest rubber. Red—of purest antimony. Steam-welded and reinforced at valve base. They will hold air.



"The supreme satisfaction of all that is fine in motor cars"

Long life is probably the most outstanding characteristic of the Packard car. It is a quality which new owners mention very frequently as the reason for their choice.

ENDURING!

For the enduring excellence of Packard transportation is the foundation of Packard's greatly broadened market. Thousands buy these fine cars with the calculated intention of keeping them at least five years—and with the knowledge that on such a basis Packard ownership costs no more per year than they have paid for half price cars of far less comfort and distinction.

Packard makes it easy and desirable for its owners to keep their cars. No radical design changes intrigue them annually. And Packard beauty, of line, finish and upholstery, endures as surely as the sturdy precision of its famous chassis.

Ask The Man Who Owns One

PACKARD

STOCKHOLM—*The Venice of the North*
a city of canals and bridges and palaces and parks—capital and pride of Sweden

RAYMOND-WHITCOMB

NORTH CAPE CRUISE

Sailing June 28, 1927, on the 20,000 ton Cunard liner "Carinthia"

VISITING *Stockholm* in Sweden—*Visby*, the romantic island city of the Baltic, with massive medieval walls and ruined Gothic churches—*Copenhagen*, the gay capital of Denmark—*Bergen*, the old Hanseatic city on the North Sea—historic *Trondhjem*, formerly the capital of Norway—*Hammerfest*, the northernmost town in the world—*Reykjavik*, capital of remote Iceland—*Lyngen*, with its Lapp settlement—the *North Cape*, and the spectacular *Norwegian Fjords* with their quaint and inviting villages.

This is the perfect vacation trip—a summer voyage of discovery to wonderful northern lands that few travelers know—a month of delightful and restful sailing on the newest Cunard steamship—long days in smooth waters and nights that are illumined by the glorious Midnight Sun.

SAILING at the height of the favorite season for trans-Atlantic travel, it makes also a novel and supremely interesting voyage to Europe ⟷ It will reach France and England on July 30, in ample time for summer travel in western Europe ⟷ The prices include homeward passage by any Cunard liner this year ⟷ $800 and upward.

Send for the booklet, "THE NORTH CAPE CRUISE"

LAND CRUISES IN AMERICA

THE most complete and luxurious trips ever planned ⟷ Special trains composed of cars built especially for Raymond-Whitcomb—with gymnasium, lecture hall, ladies' lounge, bedrooms with private bath, etc. ⟷ Routes that are independent of railroad schedules and include interesting places which are not ordinarily accessible ⟷ Frequent Cruises from June to September.

Send for the booklet, "LAND CRUISES"

Africa Cruise, January 14, 1928 ⟷ *Round the World Cruise, January 18, 1928*
Mediterranean Cruise, January 21, 1928

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Executive Offices: 26 Beacon Street, Boston, Massachusetts

New York Philadelphia Chicago Los Angeles San Francisco

Buick
sets a *value* for the dollar that *always* is the *Standard of Comparison*

VALVE-IN-HEAD Buick MOTOR CARS

WHEN BETTER AUTOMOBILES ARE BUILT, BUICK WILL BUILD THEM

The Southern Railway System is conducting forestry work along its lines in Southern Carolina on a tract of 19,000 acres, inherited from the days of wood-burning locomotives. It is demonstrating that the adoption of modern methods of forestry and reforestation pays both large and small owners of timber tracts.

The Development Service of Southern Railway System, Washington, D.C., will gladly aid in securing industrial locations, farms and home sites in the South.

Woodland Wealth

A soft green mantle of great forests clothes the rugged backbone of the Appalachian Range and the coastal plains of the South. Almost one-half of the nation's lumber supply is furnished by the South.

The South values her trees among her most precious possessions. No longer do men slash away whole forests here, with no thought of the morrow. The Southern States and Southern lumber companies are cooperating to carry out not only conservation policies but also reforestation programs.

The value of Southern forest products and the output of the Southern woodworking industries total more than $800,000,000 yearly. And each year the Southern lumber industries find an ever widening demand for their products.

Timber is one of the South's great natural resources. But this rich heritage is being conserved and developed for future generations as well as contributing its share to present prosperity.

SOUTHERN
RAILWAY SYSTEM

THE SOUTHERN SERVES THE SOUTH

The testimony of a great statesman

is added to those praising Oilomatic Heat –

that of The Rt. Hon. Sir Robert L. Borden

THE RT. HON. SIR ROBERT LAIRD BORDEN
P. C., G. C. M. G., K. C., D. C. L., L. L. D.
Former Prime Minister of the Dominion of Canada
Member of Imperial War Cabinet, London
Canadian Representative at Versailles

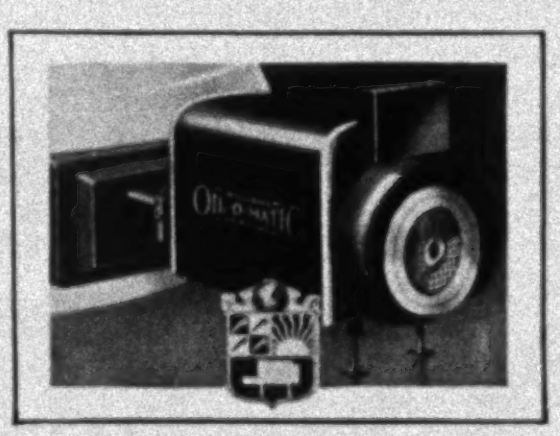
THOUGH modest to the extreme concerning his personal achievements, Sir Robert feels no constraint in lauding the service of his Oil-O-Matic. No one thing in Glensmere, his beautiful Ottawa home, has afforded him so much genuine comfort. Not alone in the evenness of temperature, but in the complete relief from the entire problem of heating. And despite his being so deeply preoccupied with world problems, he has noted how immaculate is this modern way of heating.

"I have much pleasure," he said, "in assuring you of our complete satisfaction. The colder the weather becomes and our need for comfort increases, Oil-O-Matic seems to possess the remarkable feature of functioning even more efficiently."

The surprising thing is not that Oil-O-Matic serves him so well, but that any one in any size home may enjoy this same luxury. Oilomatic heat is not a symbol of wealth. Rather it is evidence of a desire to make home life more enjoyable.

Your present fuel cost is not the cost of heating. To this must be added all the labor, discomfort and extra cleaning. Oil-O-Matic eliminates all these and gives you dependable, clean, even heat for practically the same amount you are now spending. Frequently it shows an actual saving. Oilomatic heat means far more than a change in fuel.

All the advantages that have led more people to select Oil-O-Matic than any other oil burner, may be yours. They are explained in our newest booklet, profusely illustrated in colors. Send for it today. Your local oilomatician, trained in oil heating, will gladly arrange terms to suit your convenience.



Williams Oil-O-Matic Heating Corp.,
Bloomington, Ill.

Please send me without obligation a copy of "OIL HEATING at its best."
NG10

Name.....

Street address.....

City..... *State*.....

WILLIAMS OIL-O-MATIC HEATING

This Habit Pays Dividends

Of those you see in a dentist's waiting room only a very few are there of their own accord. The others are seeking relief from pain. As a simple health measure, let your dentist prevent trouble. See him every six months.

Pyorrhea's grim record is 4 out of 5

Too often the pursuit of pleasure and wealth gives way to a heartbreaking struggle for health. It is the price of neglect. And 4 out of 5 after forty (thousands younger) pay this toll. They sacrifice health to the enemy—Pyorrhea.

Stealthy in its attack and ruthless, Pyorrhea poison always wins if let alone. Forming at the base of teeth it seeps through the system. Health is ravaged. And very often it causes such troubles as rheumatism, neuritis, anemia, facial disfigurement and nervousness.

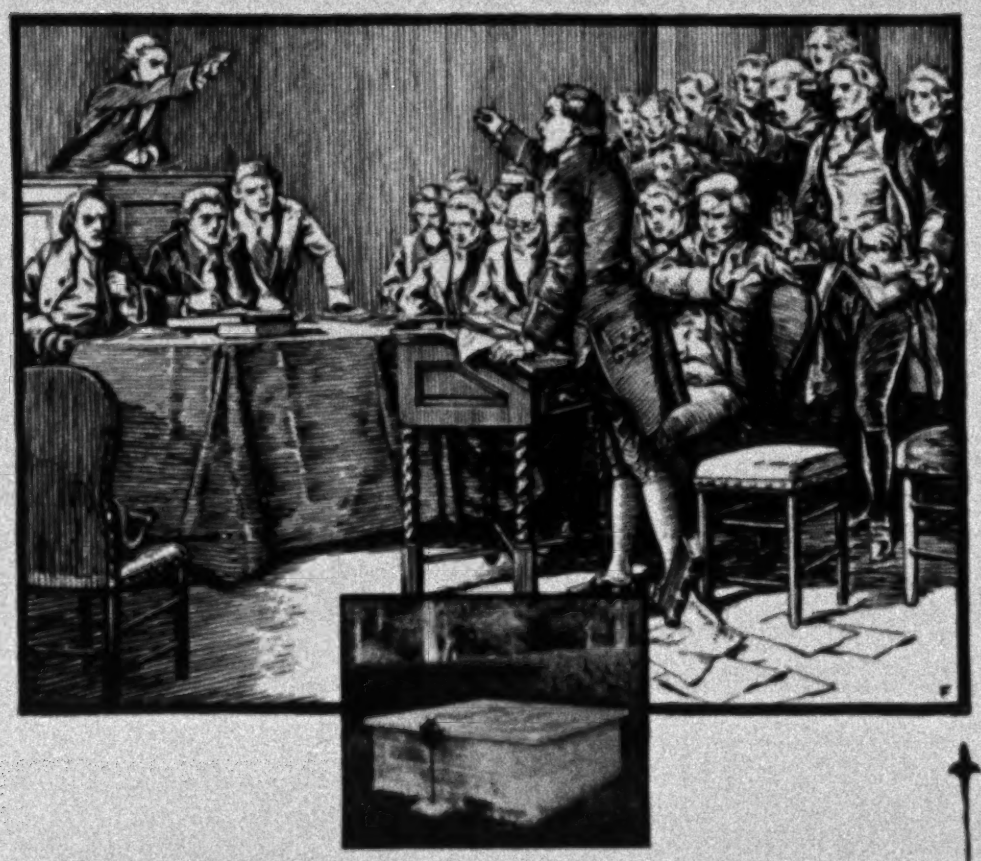
At such uneven odds, never pit health against this foe. Provide protection. See your dentist at least twice each year. And start using Forhan's for the Gums, daily.

If used regularly and in time, Forhan's for the Gums, the formula of R. J. Forhan, D. D. S., for many years a Pyorrhea specialist, helps to ward off Pyorrhea or to check its course. It firms gums and keeps them healthy. It protects teeth against acids which cause decay and keeps them snowy white.

As a simple preventive measure that pays dividends in good health use Forhan's for the Gums, regularly, morning and night. At all druggists, in tubes, 35c and 60c.

Formula of R. J. Forhan, D. D. S.
Forhan Company, New York

Forhan's
FOR THE GUMS



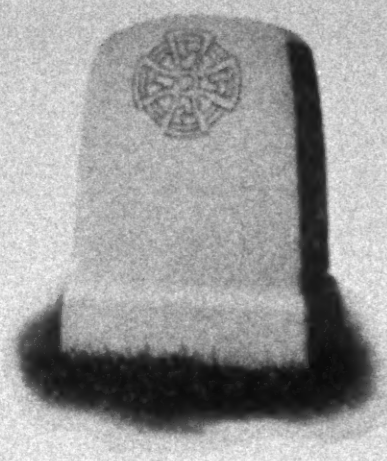
Patrick Henry, who died on June 6, 1799, is buried just outside the garden of his last home, "Red Hill," in Charlotte County, Virginia.

Number Four of a Series

Patrick Henry

Prophet, herald, and orator of the Revolution, whose burning eloquence roused the colonies to resist oppression, until the heart of Loyalist Virginia throbbed in unison with the heart of Puritan Massachusetts.

"Mark Every Grave"



It is only when we have carved our thought in a material whose flawless beauty remains unchanged through the ages, that we have symbolized in a fitting manner our reverence and love.

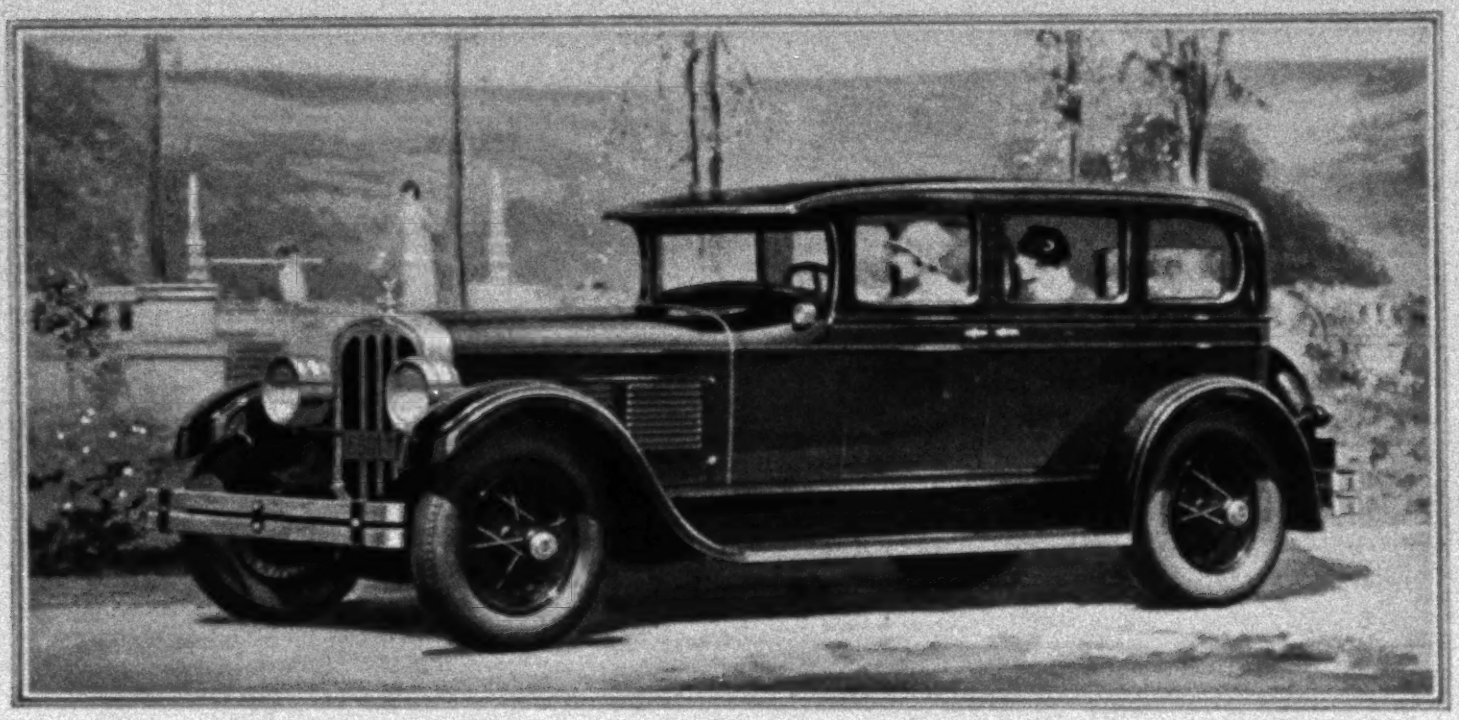
Our Certificate of Perfection, when requested from any memorial dealer, assures you of our personal inspection through the various stages of completion and is your perpetual guarantee against defective workmanship and material.

Write for Booklet "G"

Rock of Ages
"The Flawless Barre Granite"

ROCK OF AGES CORPORATION
BARRE, VERMONT

GLORIFYING THE MODERN MOTOR CAR WITH NEW IDEALS OF MAGNIFICENCE



THE NEW ROYAL EIGHT

by

THIS is the Eight that is constantly being pointed out and admired for its charming design . . .

The Eight with "the million dollar interior"— lavishly equipped and appointed with every luxury, every nicety, every comfort you could ever conceive in a car . . .

The Eight that is giving everybody who drives it a new notion of smooth motion—thrilling everybody with the power of its marvelous eight-cylinder Pikes Peak Motor—delighting everybody with its superb sensitiveness to throttle and brakes . . .

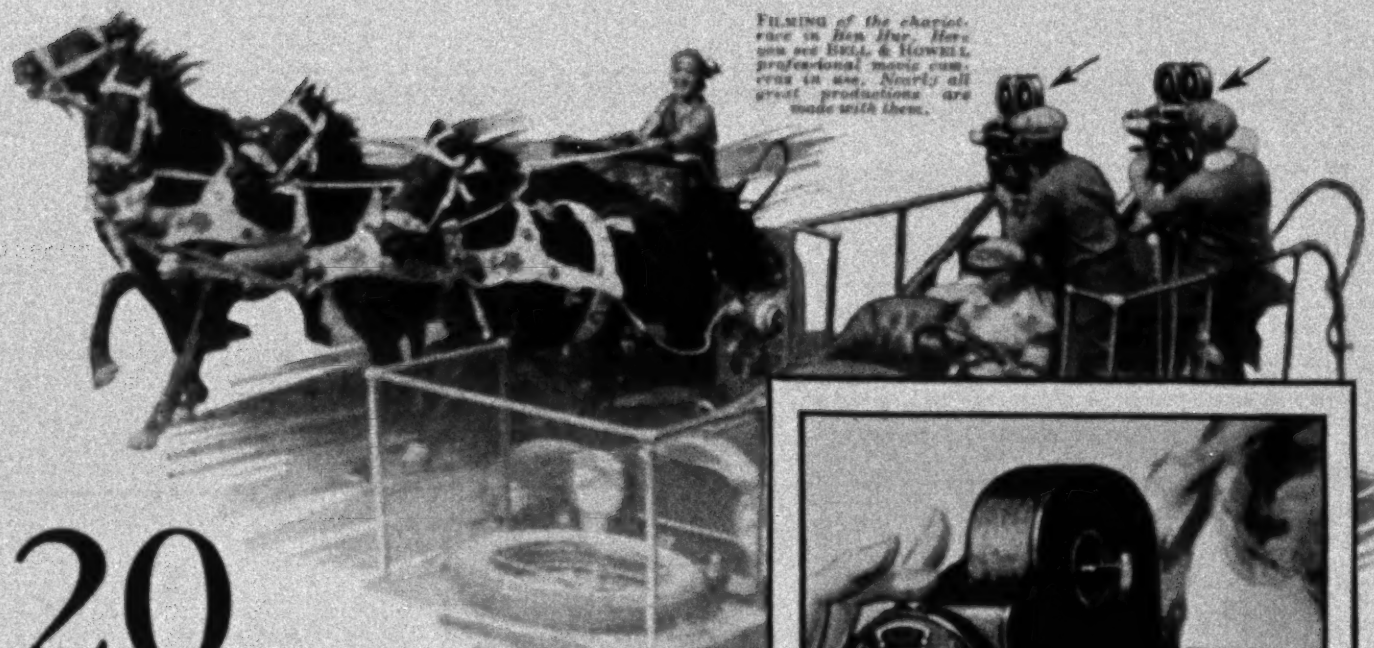
The Eight that is able to glide along at a velocity of seventy-five miles an hour, or better, with less fuss or exertion than some cars exhibit at the rate of forty!

Likewise remarkable in performance, likewise beautiful, are the new 1927 Chandler Sixes—a magnificent line of Eights and Sixes together—a choice of twenty-five different body styles—at a price range of $945 to $2295, f. o. b. factory. See—drive—compare!

CHANDLER-CLEVELAND MOTORS CORPORATION, CLEVELAND; *Export Dept.*, 1819 Broadway, New York City

CHANDLER

ROYAL EIGHTS BIG SIXES SPECIAL SIXES STANDARD SIXES



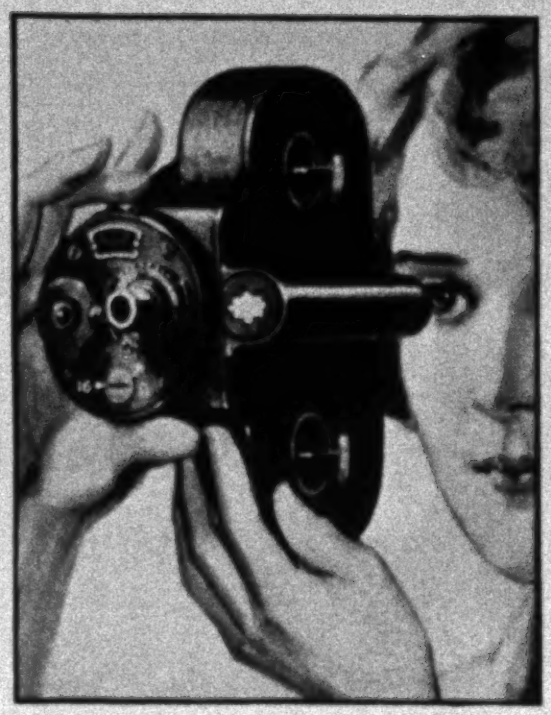
FILMING *of the chariot-race in Ben Hur. Here you see* BELL & HOWELL *professional movie cameras in use. Nearly all great productions are made with them.*

20 YEARS

of Professional Movie Cameras
brought the BELL & HOWELL *Automatic*

Filmo REGISTERED *for taking*

Your Own Movies



Professional Accuracy
WITH AMATEUR EASE

THEATRE motion pictures bearing such worthy names as Famous Players-Lasky, Paramount, Metro-Goldwyn Mayer, Associated First National, De Mille, Universal, Vitaphone, Warner Brothers, Fox, Kinograms, International, many others, illustrate the use of Bell & Howell professional cameras.

From such vast experience comes the Bell & Howell FILMO Camera, Projector and equipment for making movies of *your own*. That is why many features, necessary to best results, are found only in FILMO equipment.

Professional Accuracy with
AMATEUR SIMPLICITY

Nothing could be simpler than taking personal motion pictures with FILMO. It is the *original* automatic amateur movie camera. Simply hold FILMO to the eye and look through the spy-glass viewfinder. Then press the button and "what you see you get," automatically. No focusing for distance. No cranking. No tripod necessary. Easier than taking snapshots. An eight-year-old child can use FILMO and get perfect motion pictures.

When you feel the need of greater variety in your pictures use the special FILMO features—variable speed, optional s-l-o-w motion mechanism, interchangeability of lenses, and other exclusive features. Everything simple, but based on long experience in making motion picture cameras for leading producers all over the world.

Eastman Safety Film (16 m/m)—in the yellow box—used in FILMO camera is obtainable at practically all stores handling cameras and supplies. Original film cost covers developing and return postage to your door.

Then you are ready to show your movies on a wall or screen at home with the remarkably simple FILMO Automatic Projector. Attach to any electric light socket, press a button and movies you have taken with FILMO camera flash to life. For further variety in home movies select from the many entertaining subjects in FILMO Library at little more than cost of raw film.

The interesting FILMO booklet, "What You See, You Get," answers all questions. Mail coupon for it. Nearest FILMO dealer's name will be sent also.

BELL & HOWELL COMPANY
1817 Larchmont Ave., Chicago, Ill.
Please send me your descriptive FILMO booklet, "What You See, You Get."
☐ Send circular describing EYEMO Camera using standard (35 m/m) film.
Name .....
Address .....
City ..... *State* .....

There is also EYEMO *for those interested in using standard (35 m/m) film*

BELL & HOWELL COMPANY

1817 Larchmont Avenue, Chicago, Illinois

New York, Hollywood, London (B. & H. Co., Ltd.) · *Established 1907*

«He waited an extra week to cross on the Mauretania»

(An eavesdrop from The Ritz)

«He» is of the travel-wise from The Avenue who prefer the MAURETANIA for:—

Her speed . . . she holds the world's records;

Her Passenger List . . . including many of one's friends and acquaintances;

Her menu . . . an irresistible story of expert chefs and fine food.

And . . . the genial cosmopolitan atmosphere of her exquisite salons . . . her new luxurious staterooms with beds and private baths . . . and of course the perfect service from her British stewards . . . are three other and three excellent reasons why smart and seasoned travellers are willing to wait to travel on the MAURETANIA.

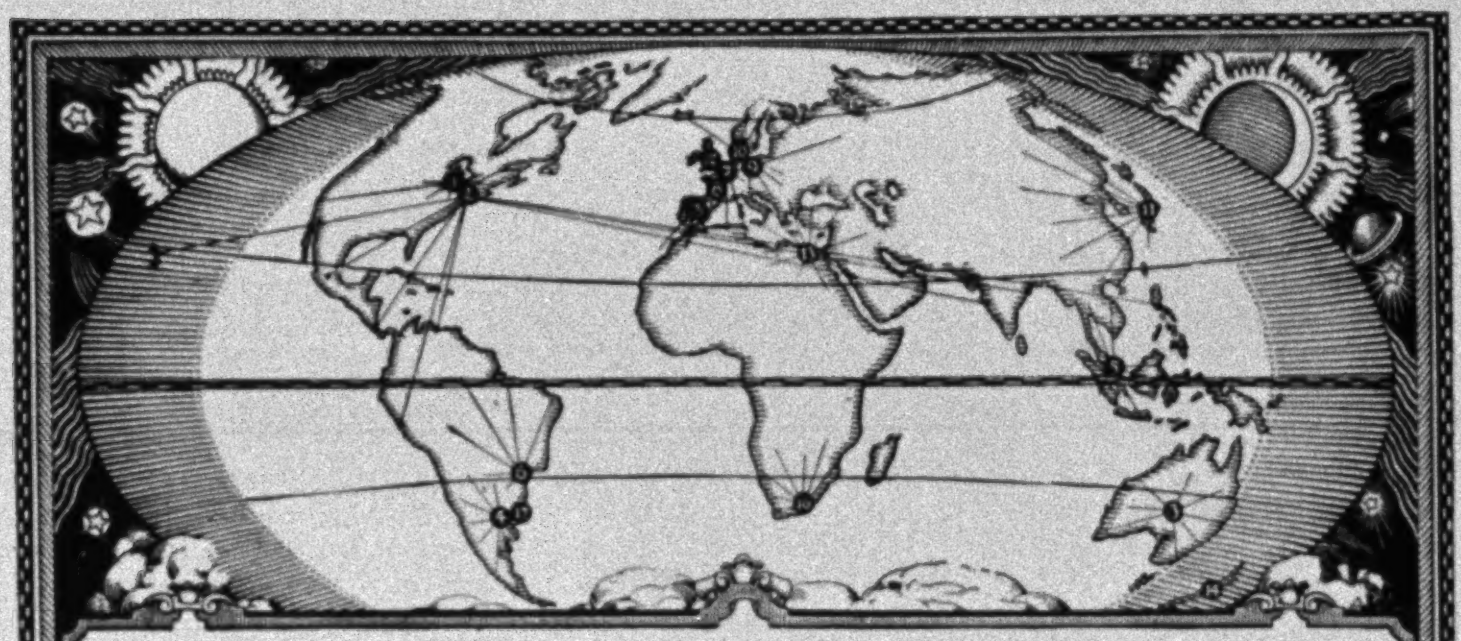
THE MAURETANIA SAILS
May 25 · June 15 · July 6

TO PLYMOUTH, CHERBOURG SOUTHAMPTON

CUNARD LINE

See Your Local Agent

1840 · EIGHTY · SEVEN · YEARS · OF · SERVICE · 1927



AN INTERNATIONAL BUSINESS

AUTOMOTIVE EXPORTS rank first in value of all manufactured products exported and third in value of all exports from the United States and Canada. General Motors cars sold overseas contribute 30% of the total value of all automotive exports and exceed those of any other American maker.

In 1926 the wholesale value of General Motors cars sold overseas approximated 100 million dollars, or more than 9% of the total business of General Motors.

At 20 strategic centers of world trade General Motors now has subsidiary companies assembling cars and selling them overseas through 5000 dealers in 104 countries. General Motors has made an investment overseas of 30 million dollars in plant-equipment and working capital. Being permanently in business in those countries, it is making itself a vital part of their economic life. And so the prosperity of General Motors is becoming interwoven with the commerce and trade of many peoples.

GENERAL MOTORS

CHEVROLET · PONTIAC · OLDSMOBILE · OAKLAND · BUICK · LASALLE
CADILLAC · GMC TRUCKS · YELLOW CABS, BUSES *and* TRUCKS

FRIGIDAIRE—The Electric Refrigerator

Elephants

The elephant is man's most intelligent helper. But—consider this:

The elephant is huge compared with the electric motor that runs a logging machine. Yet that motor has the power of twenty elephants.

Some day museums will exhibit, along with elephants, old-fashioned irons, wash-tubs, and all other tools whose work can be done by motors, so much better and at so little cost.

Two million elephants could not do the work now being done by General Electric Company motors. Whatever the work to be done, whether it needs the power of an elephant or the force of a man's arm, there is a General Electric motor that will do it faithfully for a lifetime at a cost of a few cents an hour.

GENERAL ELECTRIC

THE FACE OF THE EARTH
as men conceived it long ago

SUDDENLY the earth had expanded. The voyages of Columbus, Vasco da Gama, Magellan, had revealed new islands, seas, continents.

And the handful of mariners who actually put out to sea were by no means the only explorers.

Their accounts inspired thousands of cultivated men who remained at home. Imagination first followed the ships and then outreached them.

Map after map was made, published, studied, each with a new conception of what this earth might be—each an attempt to embrace within the poor limits of human understanding the tremendous facts that were daily coming to light.

What wonder that the sixteenth century became one of the most intellectually productive in the history of European civilization!

Sixteenth-century maps were inaccurate, perhaps. But they were fascinating because, true or false, they represented the earth. They were inspiring because they tore men away from provincial habits of thought and gave new largeness to their views.

Less decorative, perhaps, are the maps of to-day. Yet to-day's maps have the same inspiration for the imaginative mind in the twentieth century as the map pictured above in the sixteenth.

The study of maps, globes and atlases is as fascinating now as it was then. Packed with the delights of unexpected finds, rich in historical and literary suggestion, they have all the charm and cultural value of good books.

Why not acquire the excellent and stimulating habit of reading maps? Study them frequently. Teach your children to enjoy them.

Rand McNally Maps, Globes and Atlases are always scientific, accurate, up to date. Obtainable at leading booksellers', stationers', or direct.

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536 *S. Clark Street*, Chicago 270 *Madison Avenue*, New York

Washington San Francisco Los Angeles

Manila, Church of San Augustin, with market scene

Strange Playgrounds

across the Pacific

Discover the Orient. A new field for play awaits you in the Far East. Quickly and comfortably reached on great President Liners.

You may stop over at Honolulu, Yokohama and Kobe, then Shanghai, Hong Kong and Manila. Or sail direct to Japan from Seattle. These ports of call are gateways to the fascinating lands beyond.

From your first glimpse of mighty Fujiyama, the sacred mountain, as your ship enters Yokohama harbor, Japan will enchant you. A country of festivals, gay but ceremonious, modern and progressive.

Let China cast her spell upon you—here is the real East. And here you will shop in quaint bazars for ivories, laces and jade; for silks and batiks and rare embroideries.

Manila has the flavor of old Spain. And visit Baguio, lovely mountain resort, so easily accessible from Manila.

Palatial President Liners take you in complete comfort. All rooms are outside. Beds not berths. Spacious decks. A world-famous cuisine. Liberal stopovers at any port. Tickets interchangeable between the two lines.

A Dollar Liner sails every week from Los Angeles and San Francisco for the Orient and Round the World. Fortnightly sailings from Boston and New York for the Orient via Havana, Panama and California.

An American Mail Liner sails every fourteen days from Seattle for Japan, China and Manila.

Fortnightly sailings from Naples, Genoa and Marseilles for Boston and New York.

For complete information communicate with any ticket or tourist agent or

Dollar Steamship Line
American Mail Line

Admiral Oriental Line

32 Broadway . . . . . New York
112 W. Adams Street . . Chicago, Ill.
25 Broadway . . . . . New York
604 Fifth Avenue . . . . New York
Robert Dollar Bldg., San Francisco, Calif.
101 Bourse Bldg. . . Philadelphia, Pa.
177 State Street . . . . Boston, Mass.
514 West Sixth St. . . Los Angeles, Calif.
Dime Bank Building . . Detroit, Mich.
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Cold Refreshing
ready at any time with Frigidaire

Always plenty of ice cubes

WHAT a comfort on hot days to have a generous-sized bowl kept full of ice cubes—and to have a never-failing source that keeps the supply constantly replenished!

That's just one of the delights of Frigidaire electric refrigeration. And, no matter how many pounds of ice you take from Frigidaire, the food compartment is always cold—always safe for the preservation of even the most perishable meats and vegetables.

Then, too, you can prepare many new and tempting dishes in the Frigidaire freezing compartment. And you know a new freedom. Freedom from outside ice supply—more time away from the kitchen—more leisure hours.

Begin now to enjoy the new comfort and convenience of Frigidaire. Remember that Frigidaire is the name of the electric refrigerator that offers you all these advantages:

Even the smallest Frigidaire makes 5 pounds of ice cubes between meals—always plenty.

Complete and permanent independence of outside ice supply.

Uninterrupted service—proved by the experience of more than 300,000 users—more than all other electric refrigerators combined.

A food compartment that is 12 degrees colder without ice—temperatures that keep foods fresh.

Direct frost-coil cooling and self-sealing tray fronts giving a dessert and ice-making compartment always below freezing.

Beautiful metal cabinets designed, built, and insulated exclusively for electric refrigeration.

An operating cost that is surprisingly low.

Value only made possible by quantity production, General Motors purchasing power and G.M.A.C. terms.

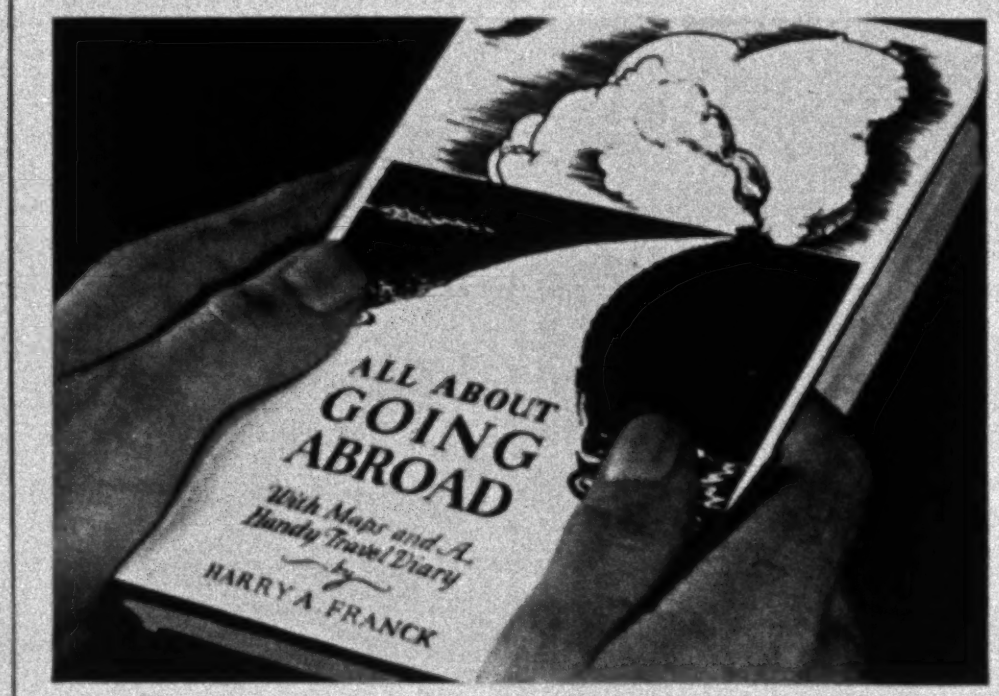
Write us for complete information about Frigidaire, or visit the nearby Frigidaire Sales Office.

FRIGIDAIRE CORPORATION, Dept. Y-302, DAYTON, OHIO
Subsidiary of General Motors Corporation

Frigidaire
PRODUCT of GENERAL MOTORS

OF INTEREST TO

TRAVELERS



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IF YOU ARE planning a trip abroad there are probably a thousand and one things you want to know. How to get your passport, what clothing and baggage you should take, how much you should tip the stewards.

These and all your other questions are answered in this new book by the famous author of "A Vagabond Journey Around the World" and many other popular travel books. Over 100 pages of valuable information, carefully indexed; in addition, special maps and a handy travel diary. A real service book which will save you possible embarrassment or inconvenience.

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WHERE LIFE IS BETTER

Starting May 15th
CALIFORNIA
$90.30
Round trip from Chicago to SAN FRANCISCO
America's Coolest Summer City
Gateway to Hawaii & Orient
Similar low fares from all points. Only $18 additional fare for full Pacific Coast Empire Tour from Canada to Mexico

If you were a Californian, and in business, your customers would be the kind who own twice as many automobiles . . . buy more of everything people like to have . . . and *then* put twice as much in savings, as the average American

You are going somewhere this summer—and California offers, in addition to a hundred vacation lands, a picture of ideal living, rapid growth, and great opportunity, told in part by the letter we are printing on this page.

California is closer to you than ever before; reduced train schedules have brought it nearly a business day closer by rail, and, if you motor, the new Victory Highway in conjunction with the Lincoln Highway will take you straight across the country into California's Great Valley and to San Francisco, the center of it all.

In San Francisco you will see a quarter of a billion dollars' worth of new buildings. The San Francisco Stock and Bond Exchange now ranks next to New York in financial volume. California, third agricultural state, is also *eighth* in value of manufactured products.

In six years, California has grown thirty-five per cent in population—with corresponding growth in land values and business opportunities. There is room for you, if you are getting ahead where you are and possess a moderate competence with which to start.

One of our newer business men tells what he thinks of California, in the letter printed below. Read it—it is a true and typical experience:

"*San Francisco, Dec. 1, 1926.*

"This year I have learned how short a time it takes to become a Californian!

"Not many families were bound together by so many strong ties as ours was back East. Nearly a dozen of us had lived all our lives in the same middle-western state where the family business was founded fifty years ago.

"When our California business grew until it was necessary for one of us to move out to San Francisco, and the choice fell on me, I boarded the train with my wife, two sons and a daughter, all feeling as though we had been banished to some strange country.

"Now our boys have finished college and have come to work with me. We supply the entire West, Australia, Hawaii and the Orient with our products. My daughter finished her professional training in one of our fine California universities and immediately began to earn an independent income.

"And when I went back last winter on a business trip, I found myself making it as short as I could—to get back to California. I discovered that we are Californians, all of us. This country of cool summers and pleasant winters is *home*.

[Name on request] R. W. B."

If you or your family are interested in California's wider opportunities for personal living and business success, write to Californians Inc., a non-profit organization of business institutions and citizens, for this 48-page illustrated booklet, "California, Where Life is Better." Clip the coupon and send it now!

WHAT THE *Californian* OWNS

Climate: Year-round producing climate.

Growth: From 3,500,000 to 5,000,000 population in six years—three times faster than the United States average.

Wealth: Twice the national average of wealth, twice the average number of savings bank depositors. Only three states report more income tax returns.

Health: Six of the fifteen most healthful cities in the United States are in California.

Education: *The Californian's* schools share first rank only with Massachusetts in efficiency.

Recreation: Four National Parks, a thousand miles of ocean shore, a thousand-mile-long Sierra playground, 30,000 square miles of National Forests, 42,000 miles of paved highways and improved roads.

Crops: Over $600,000,000 yearly. Six million acres under irrigation.

Industry: One of the youngest states, California is eighth in value of manufactured products.

Markets: From San Francisco's great harbor, the largest on the Pacific Coast, the Californian successfully sells his manufactures and crops throughout the whole world.

For every Californian-here or on the way-these advantages spell Opportunity

California

Where San Francisco hill-homes watch the sea

A sailor of the seven seas returns to his home port—San Francisco

MAIL *this coupon for* FREE BOOKLET *about life in California*

4-27

Californians Inc.
Headquarters
SAN FRANCISCO
140 MONTGOMERY STREET, ROOM 303
Please send me "California, Where Life is Better"

Name _____

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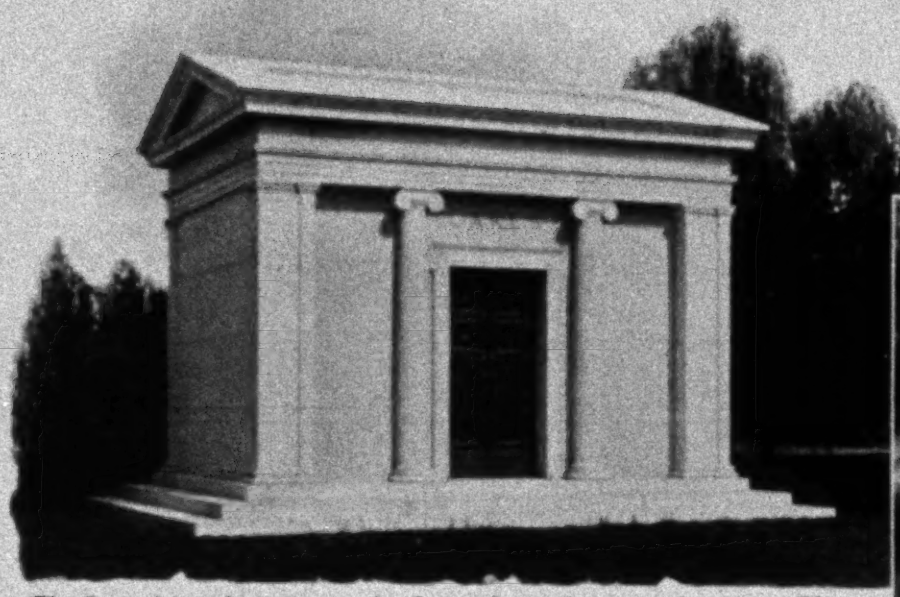


The Carew Mausoleum is erected in Spring Grove Cemetery, Cincinnati, Ohio. Victoria White Granite was used in the construction.

An attractive, polished vase memorial in Stony Creek Granite.

"NEVER leave till tomorrow that which you can do today." Build your memorial while you live, that it may be truly representative of your ideals.

Dodds' artists will give you every assistance in designing something individual. All Dodds-made memorials are furnished under a Guaranty Bond of Quality.

EXCLUSIVE PRODUCERS: ***Milford Pink Granite - Victoria White Granite - Stony Creek Granite***

(The above names protected by trade-mark)

THE DODDS GRANITE COMPANY

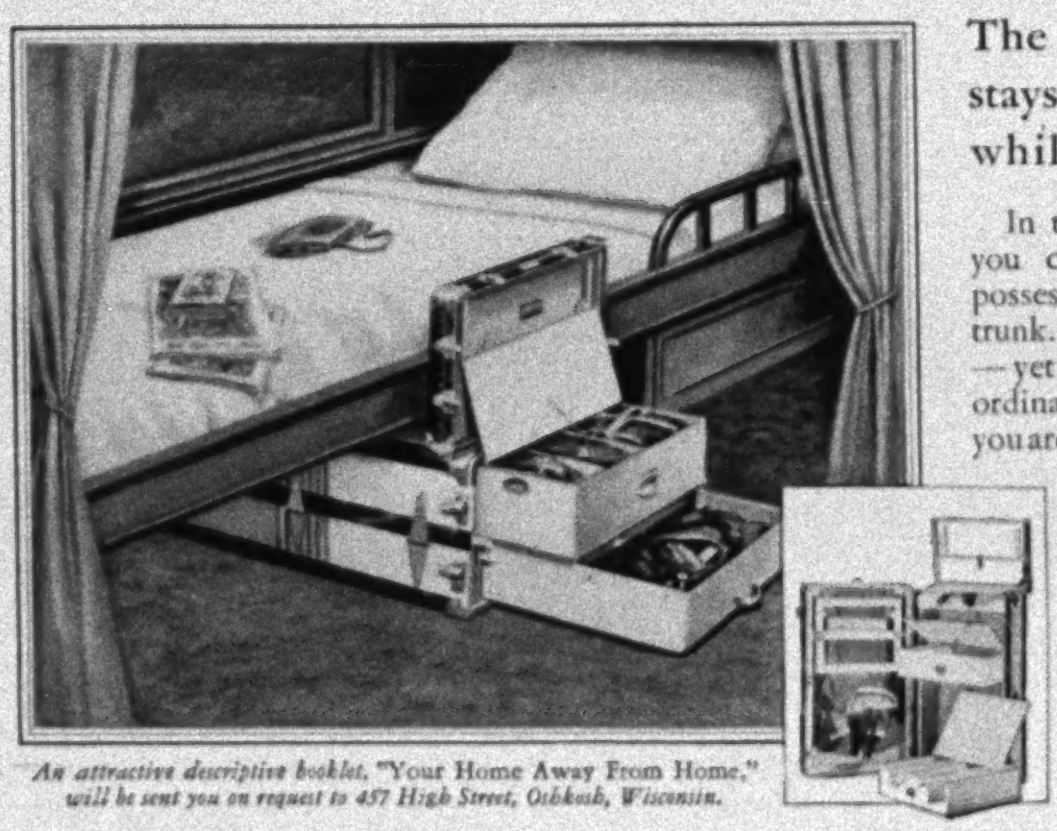
(ESTABLISHED 1864)

814 PERSHING SQUARE BUILDING, NEW YORK CITY

Quarries and Manufacturing Plants: MILFORD, MASS. KEENE, N. H. STONY CREEK, CONN.

Your Copy of "Modern Memorial Art" Sent if Requested

The OSHKOSH *Land-or-Sea*



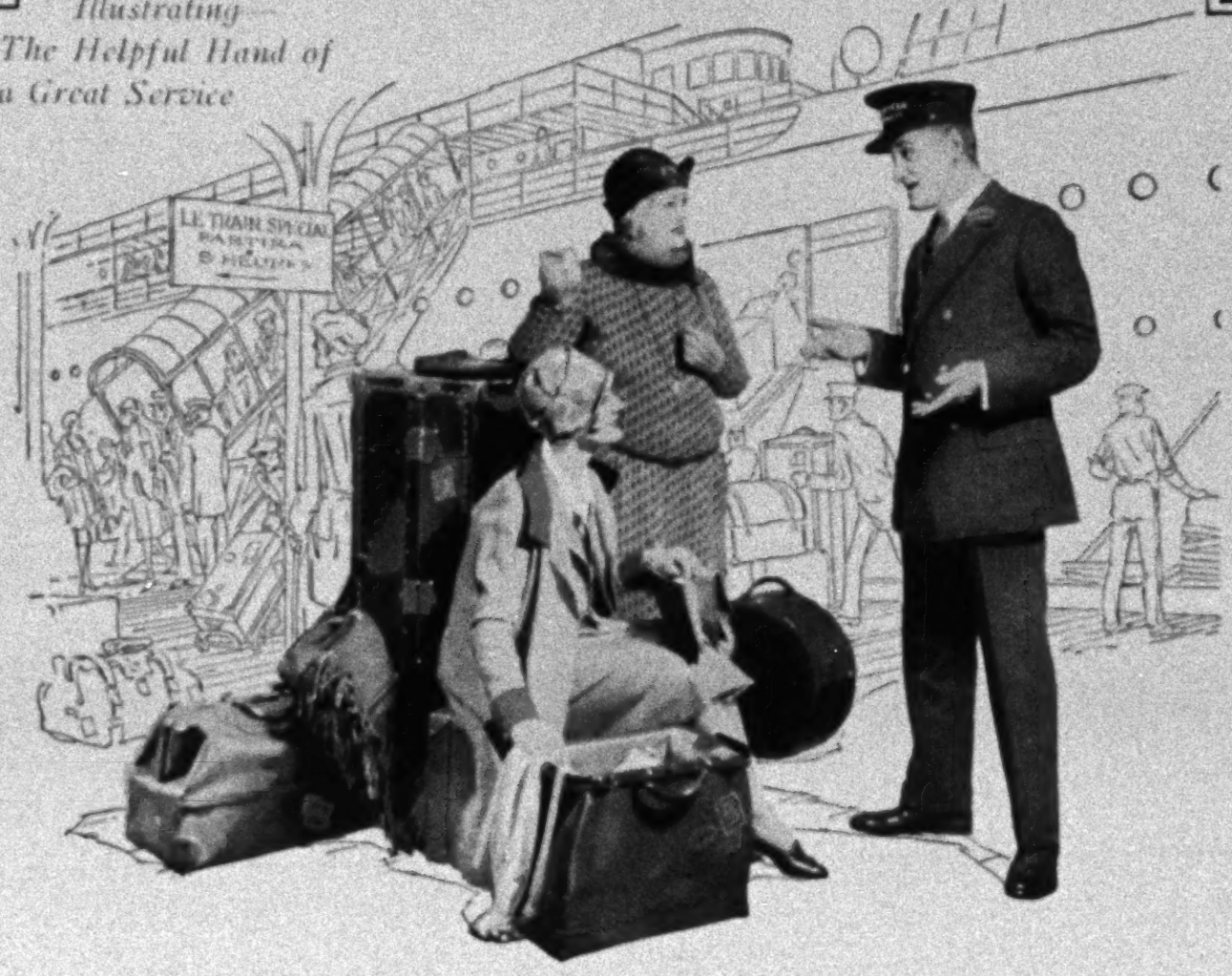
An attractive descriptive booklet, "Your Home Away From Home," will be sent you on request to 457 High Street, Oshkosh, Wisconsin.

The only trunk that stays under the berth while you unpack it

In the Oshkosh *Land-or-Sea* you can get at any of your possessions without moving the trunk. It is a *complete wardrobe* —yet it's no bigger than an ordinary steamer trunk. When you are on land, just set it up and it works like a regular wardrobe. Without doubt, this new product of the Oshkosh factories is the most ingenious and versatile trunk made.

THE OSHKOSH TRUNK COMPANY
Oshkosh, Wisconsin, and New York City

Illustrating—
The Helpful Hand of a Great Service



THE coming of an American Express courier to this American mother and her daughter, traveling abroad, was like a burst of sunshine out of a dark cloud. Perplexed, in trouble, speaking no French, they were hopeless. His good American words of cheer, his courtesy, his assurance that it was really nothing he could not easily fix—they will never forget.

Scenes like this are happening every day at foreign railway stations and ports—natural troubles of uninitiated travelers—especially women travelers. But not one of them the *Helpful Hands of a Great Service* cannot and do not relieve.

This personal Service to travelers in foreign lands—endless in its variety, constant and efficient—has won the world's good will for the American Express Company. The Service is not sold. It cannot be bought. It is freely given in the name of the American Express Company—most naturally so when you carry *American Express Travelers Cheques*.

The protection which these *sky-blue* Cheques give travelers against the loss or theft of their travel funds—and that they are spendable and acceptable everywhere—are well-known facts—established by 36 years of world-wide service.

Issued in $10, $20, $50 and $100 denominations—bound in a small, handy wallet—and cost only 75c for each $100

FOR SALE AT 22,000 BANKS, AMERICAN EXPRESS AND AMERICAN RAILWAY EXPRESS OFFICES

AMERICAN EXPRESS TRAVELERS CHEQUES

Your reading problem solved by Dr. Eliot

THERE will be a dozen competitors for your big opportunity when it comes. What will influence the man who is to make the decision among them?

"In every department of practical life," said ex-President Hadley of Yale, "men in commerce, men in transportation, and in manufactures have told me that what they really wanted from our colleges was men who have *this selective power of using books efficiently.*"

Not book-worms; not men who have read all kinds of miscellaneous books. Not men who have wasted their whole leisure time with the daily papers. But those who have read and have mastered the few great books that make men think clearly and talk well.

What are those few great books? How shall a busy man find them? The free book offered below answers those questions; it describes the plan and purpose of

Dr. Eliot's Five-Foot Shelf of Books

The books that make men think straight and talk well

Every well-informed man and woman should at least know something about these famous "Harvard Classics." The free book tells about it—how Dr. Eliot put into his Five-Foot Shelf "the essentials of a liberal education," how he arranged it so that even "fifteen minutes a day" are enough, how in pleasant moments of spare time, by using the reading courses Dr. Eliot has provided for you, you can get the knowledge of literature and life, the culture, the broad viewpoint that every university strives to give.

Send for this FREE booklet that gives Dr. Eliot's own plan of reading.

Every reader of this column is invited to have a copy of this handsome little book. It is free, it will be sent by mail, and involves no obligation of any sort. Merely clip the coupon and mail it today.

Education—*applied* education—is the greatest tool anyone can have in making a success socially or in business. The coupon below brings complete information.

P. F. Collier & Son Company
250 Park Ave., New York City

By mail, free, send me the booklet telling all about the most famous library in the world, describing Dr. Eliot's Five-Foot Shelf of Books (The Harvard Classics), and containing the plan of reading recommended by Dr. Eliot. Also please advise how I may secure the books by small monthly payments.

Name Mr. / Mrs. / Miss .....

Address .....

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The publisher cannot undertake to send the booklets free to children.

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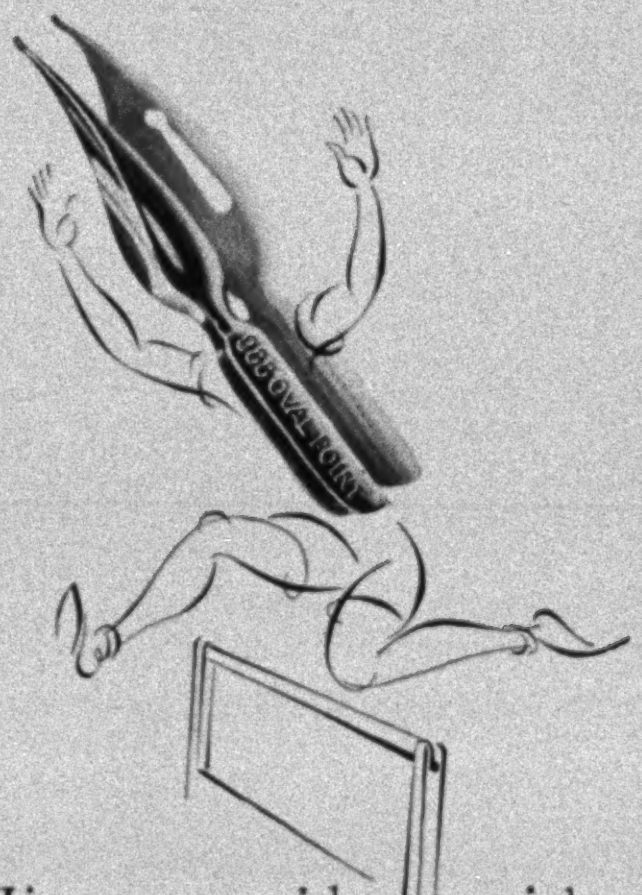

Hit *your* stride with a *nine-eighty-eight!*

FRESH—fast—a flying start—hurdling all obstacles! This ball-pointed pen fairly races *with your message!*

Rough paper cannot make it falter. Freely, clearly, it speeds your thought onward. The special Radio finish insures smooth action and long wear.

Not just "any old pen" can make your writing so clearly, unmistakably *you*. To write your best you need a *fresh* pen —a fresh Esterbrook!

Among the many Esterbrook styles, there's one to suit *your* hand. Let the coupon below help you find it.

Buy Esterbrooks at any good stationery or drug store.

Esterbrook PENS

TRUE ECONOMY · ALWAYS A *FRESH* ESTERBROOK

FREE ESTERBROOK PEN COMPANY, Dept. N-4, CAMDEN, N. J.

- ☐ Please send me, free, "The Book of 100 Famous Signatures," showing the autographs of illustrious men and women—and a sample of Radio Pen No. 988.
- ☐ Please send me, free, the Esterbrook Chart of Handwriting to help me find the pen best suited to my hand—also a sample of Radio Pen No. 988.
- ☐ I enclose 10 cents, for which please send me an assortment of the most popular Esterbrooks.

WRITE YOUR NAME AND ADDRESS IN THE MARGIN BELOW

"No one could make Stradivarius violins by mass production . ."

Thomas A. Edison now answers a questionnaire

FROM his laboratories Thomas A. Edison has from time to time issued questionnaires. Now, he has consented to become the interrogated—has agreed to lay bare his half-century of effort to give the world perfect Re-Creation of music.

In plain, untechnical words, Mr. Edison here tells how he has made a marvelous musical instrument with all the painstaking care and individual detail of a Stradivarius Violin.

The questions asked Mr. Edison were:

Ques. Do you take advantage of the economies of mass production in the making of your phonograph?

Ans. I consider the New Edison Phonograph a musical instrument and not a machine to be made in the manner of cheap furniture or other things in which the highest uniform quality is not a prime essential.

Ques. Isn't it possible to make instruments of Edison quality by mass production?

Ans. No greater proof of the fallacy of this, as far as phonographs and other musical instruments are concerned, can be offered than the vain efforts of violin manufacturers to make violins of Stradivarius quality by mass production. For although every part of the instrument may be exactly alike as to size, unless there is the individual human touch, there is bound to be a variation in tone quality.

Ques. How can the layman tell the difference between a phonograph made by mass production and one made by craftsmen?

Ans. Anyone is apt to be satisfied with existing conditions until he hears something better; may even excuse distorted tone for want of a superior instrument. But when an ordinary phonograph turned out in quantity is compared side by side with one in which human hand work has played its part, the glaring difference instantly is apparent.

Like a Craftsman of some old world guild; like Stradivarius in his workshop, Edison craftsmen individually make each New Edison Phonograph.

Ques. What do you consider the truest test of phonograph quality?

Ans. There is no measure of tone quality like the human ear. For this reason I urge comparison between the New Edison and other phonographs. To this end, I have advised every Edison dealer to place—without obligation to the prospective buyer—the New Edison in any home where comparison with other types of phonographs is desired.

Ques. How would you describe the tone of the New Edison Phonograph?

Ans. It is sheer nonsense to speak of the *tone* of a *phonograph* or of its resonance. A phonograph should have no tone of its own. The instrument should be *only* a medium of Re-Creation. Obviously you should be unconscious of it and hear only the beautiful music it Re-Creates.

I worked for five years and spent more than $3,000,000 in experimental work to remove any false tone from the New Edison. Even when I, myself, was satisfied with the results I did not stop there. I insisted that the New Edison be submitted publicly to the test of side by side comparison with living artists whose performances had been recorded. Exacting music critics could detect no difference between living and Re-Created performance. ★

Why There NEVER Can Be a Better Phonograph

After all, the phonograph serves but one purpose—to Re-Create voice or instrument with human reality. When a phonograph does this, nothing more can be asked—it has reached perfection.

That the New Edison Phonograph achieves this is fact—not theory nor hopeful expectation. During more than 5,000 tests in Carnegie Hall, New York, Symphony Hall, Boston and in other noted music centers, side by side tests were made with living artists who sang or played before a critical public in direct comparison with the New Edison Phonograph.

Eminent musical critics who attended these tests found it impossible to detect the living voices or instrumental performances, from the New Edison Re-Creation. Thus it was proved that the New Edison Re-Creates with literal fidelity and in a way that baffles the keenest ear in the effort to detect the living performance from the Edison Record.

Hear the New Edison Phonograph today at your nearest Edison dealer's—also get him to play one of the Edison 40-minute records—the inventor's latest achievement—a record no larger than the usual short playing record which permits you to enjoy without interruption a complete concert on one double-faced record.

The New Edison has always sold by comparison—compare it yourself with any other phonograph and let your own ears decide.

The NEW
EDISON
PHONOGRAPH

Ok Thos A Edison

★ WATCH FOR OTHER QUESTIONNAIRES BY MR. EDISON

To Satisfy Yourself

Let us show you that the claims men make for this unique shaving cream are true —accept 10-day tube to try

GENTLEMEN:

You've heard men advance some pretty broad claims for Palmolive Shaving Cream. Claims which make your present favorite take second place.

Let us show you that the claims men make for this unique shaving cream are true—accept 10-day tube to try. Made by the makers of Palmolive, the world's leading toilet soap, 60 years of soap study stand behind it.

Read these 5 advantages

1. Multiplies itself in lather 250 times.
2. Softens the beard in one minute.
3. Maintains its creamy fullness for 10 minutes on the face.
4. Strong bubbles hold the hairs erect for cutting.
5. Fine after-effects due to palm and olive oil content.

Just send coupon

Your present method may suit you well. But still there may be a better one. This test may mean much to you in comfort. Send the coupon before you forget.

THE PALMOLIVE CO.
(Del. Corp.),
CHICAGO, ILL.

3511

10 SHAVES FREE

and a can of Palmolive After Shaving Talc

Simply insert your name and address and mail to Dept. B-1323, The Palmolive Company (Del. Corp.), 3702 Iron Street, Chicago, Ill.

Residents of Wisconsin should address The Palmolive Company (Wis. Corp.), Milwaukee, Wis.

.....

.....

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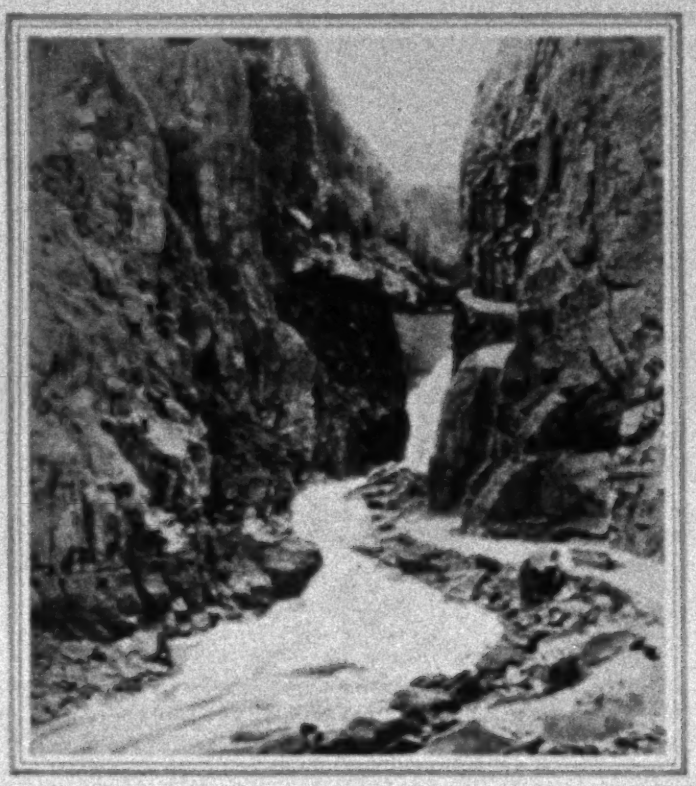

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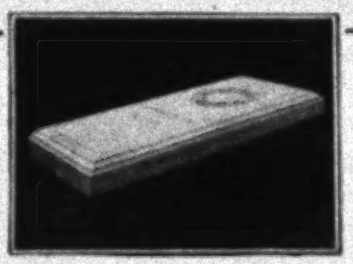

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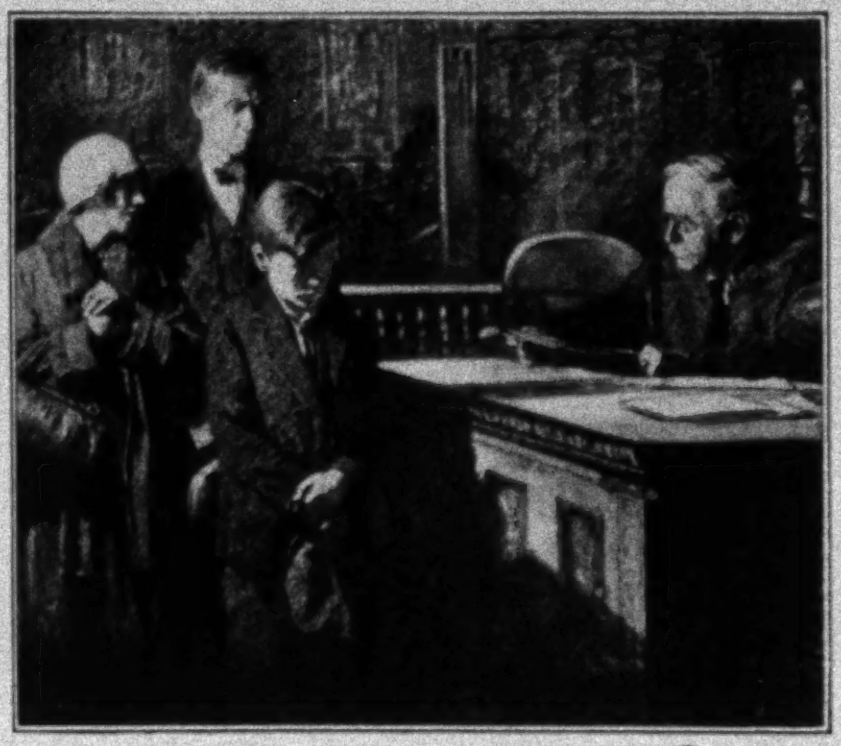
THIS is a clumsy world for children. They are constantly running into the barbed wires of our grown-up principles and conventions. Every year thousands of them get into trouble which brings them before the Juvenile Courts. Rarely are these unfortunate youngsters really bad. Nearly always the hidden cause behind their waywardness is lack of proper guidance at home. Oftentimes, physical conditions cause their abnormality. When health is restored the vicious tendencies often disappear.



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Delinquent children are by no means found to come only from homes of poverty. From well-to-do and even rich homes have come children with tendencies toward crime which have amazed their parents. Too late these fathers and mothers learned that in reality they never had known their sons and daughters.

May Day—Children's Day

May First has been set aside by the nation as a day on which mothers and fathers, philanthropists and public-spirited men and women, interested in America's future, join in one great purpose—the big, important work of checking up the health of the children of this country.

It is a great forward step to set aside a definite day to have eyes, ears, noses, throats, and teeth examined for possible physical defects. But why stop half way? Examine minds just as thoroughly for possible mental troubles.

In May, then, after you good fathers and mothers have found out whether or not your children are sound and healthy, physically, you will want to have an old-fashioned, heart-to-heart talk with the youngsters and learn what they are thinking about, who their companions are, and where they spend their time.

Lacking a friend at home, a child may need a friend at court.

Each year more than 200,000 children are brought before the Juvenile Courts charged with more or less serious offenses. Seventy-five per cent of all adult offenders begin their criminal careers before reaching the age of 21. The steps are fast from petty thieving to murder.

In the three year period, 1923, 1924 and 1925, the homicide mortality rate in the United States mounted to the highest point ever recorded.

In 1926 there were approximately 10,000 homicides. In recent years our homicide rate has been 600% greater than that of Canada and 1400% greater than that of England and Wales.

Even the best of children develop tendencies hard for parents to understand. These faults, if uncorrected, may produce serious consequences.

The Metropolitan has prepared a booklet, "The Mind of the Child". It may help you to deal fairly and wisely with your children in solving the many vexing problems that come up in connection with them. Send for it. It will be mailed without cost.

HALEY FISKE, *President.*

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AMONG THE ZAPOTECS OF MEXICO

A Visit to the Indians of Oaxaca, Home State of the Republic's Great Liberator, Juárez, and Its Most Famous Ruler, Diaz

BY HERBERT COREY

AUTHOR OF "ADVENTURING DOWN THE WEST COAST OF MEXICO," "THE ISTHMUS OF TEHUANTEPEC," "ALONG THE OLD SPANISH ROAD," "THE GREEN MOUNTAIN STATE," ETC., ETC., IN THE NATIONAL GEOGRAPHIC MAGAZINE

With Illustrations from Photographs by Clifton Adams, Staff Photographer

THE visit to Oaxaca aroused us the moment we heard the pretty girl tell Jim to take his feet off the goldfish.

It had been interesting long before. The visitor to Mexico is made into an antiquarian in spite of himself. He discovers a liking for old books and musty libraries. The deeds of the incredible Spaniards who conquered the land in the sixteenth century become of an immediate and pressing interest. Pedro de Alvarado the Cruel, and Sandoval the Faithful, and Hernán Cortez himself are almost clothed in flesh.

MEXICO HAS HAD SCORES OF PRESIDENTS IN 70 YEARS

So far as the evidences are visible, there have been but two ages of progress in Mexico. In the 300 years from the Conquest, in 1519-21, to the Republic the dominating Spaniards built more than 9,000 churches, not to speak of monasteries and convents; constructed highroads that are in use to-day and laid cobbled streets over which one still jolts. They brought the most remote tribe into subjection and opened mines and compelled order.

The second period of progress began in 1858, when Benito Juárez, pure-bred Zapotec Indian, became one of the scores of presidents who have been created in the almost eight hundred major or minor internecine wars that have plagued Mexico. One politician, Pedro Lascuráin, held the post of chief executive for just 40 minutes.

The memory of Juárez is venerated in Mexico as is that of no other man. The Law of Juárez, which established the judiciary on a more nearly firm foundation, and the Reform Laws, were his work. Soon after Juárez came Porfirio Diaz, of Mixtec Indian blood, who kept Mexico fairly peaceful for almost thirty years. During his rule the railroads were built and the land opened to foreign capital.

The State of Oaxaca, which extends from the jungles of Tehuantepec, on the Pacific coast, to the Cordilleran highlands, was the theater of the exploits of these men. Alvarado discovered the treasures of its mines and Sandoval defeated the Mixtec Indians who guarded them. The

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PUEBLA LOOKS UP TO TWIN VOLCANOES

Its numerous violent outbursts have earned for Popocatepetl (at the left) the sobriquet, Vesuvius of America. A deeply curved saddle links it with Ixtaccihuatl, to the right (see, also, page 506). Cortez marched on the Valley of Mexico over a road built across the saddle.

King of Spain gave a part of Oaxaca to Cortez as a reward, and thereafter he was known as the Marquis of the Valley.

Benito Juárez was born in a grubby little village high in its hills, and Porfirio Diaz first saw the light in the city itself. Decidedly Oaxaca (pronounced Wah-hah-cah) is worth seeing.

Our visit really began at Puebla. When we reached this fine old town, the third largest in Mexico and perhaps the most beautiful, we found most of the hotels filled to the roof.

The bandits were raiding some of the outlying districts and the people were coming in for safety. There was talk of a fresh revolution and soldiers and politicians had swarmed in to the city. It is a fact that in most countries street-fighting in moderation seems to attract crowds rather than to drive them away. The pacific citizens seem to regard these affairs as spectacles to be patronized at discretion.

BETWEEN BATTLES IN PUEBLA CITY

As the horses which drew our little, half-roofed carriage clinked over the cobbles, we saw soldiers marching in squads or standing guard in front of house doors. Our driver confided in a hoarse whisper that the previous night the rebels had mounted to the roof of the cathedral and fired down into the fine old Plaza de la Constitución, in which 500 of General Scott's men under Colonel Childs held Santa Anna's army of 2,500 at bay in 1847.

"In the morning," he said, in a fine, throaty murmur, "one sees in the doorways the bodies of those who were shot during the night."

We walked out that evening, hoping to see a midnight murder or at the very least a skirmish with the revolutionists. Nothing happened.

The little street cars, engined by Henry Ford instead of by the accustomed Mexican mule, went clattering about their business. The tall palms of the plaza feathered against the silver disk of the moon. The restaurants which front the cathedral were being emptied, and their gossiping patrons gathered under the archways to look at belated women hurrying home. We returned to the hotel.

"If the señor would pay now," hinted the proprietor, delicately veiling a yawn. "One must sleep. For nights past the accursed revolucionistas"——

One is not accustomed to pay one's hotel bill in advance; but there seemed to be no escape. Our names were marked up on the blackboard, which takes the place of a hotel register in Mexico, with our nationalities and occupations. All the other patrons had paid and their bills had been receipted on the board, even to one of the guests who gave as his occupation a general of the Mexican army, and had taken their keys from the hooks.

HOTEL KEEPING IN PUEBLA UNDER DIFFICULTIES

We suggested that we would like an early morning call, a porter for the baggage, and plenty of coffee and hot rolls. The proprietor replied:

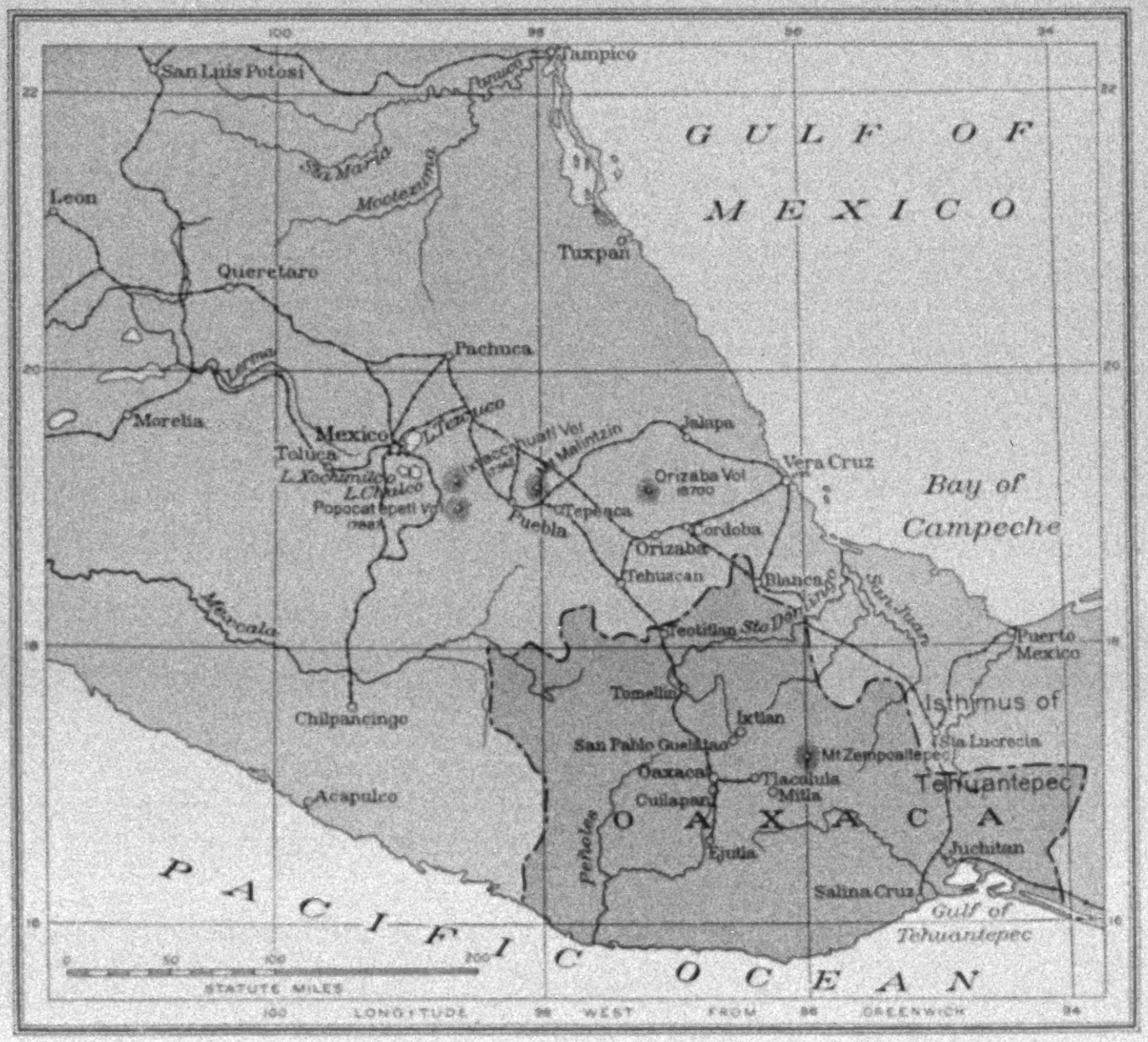
"There is no one to call you; I do not get up so early and the porter is a dog who cannot be trusted. There will be no coffee and the running water has been cut off by the villainous revolucionistas. There will be no carriage to the railway station. There may be no train. One never can tell."

Having reached this perfect understanding, we went to bed. Our own alarm clock wakened us the next morning and we stumbled down winding stairs, with our bags on our shoulders, to find the great doors of the hotel locked and barred.

An automobile was parked away from thieves inside the entrance arch, and, half hidden by it, two barefooted soldiers, blanket-wrapped, their beady eyes glistening under soiled cotton caps, sat propped against the halves of the door, rifles hugged to their breasts.

They seemed to look on us with suspicion, but the usual happened. We smiled, after a time they smiled, and all was well. In the wind-swept street stood a waiting carriage, the driver asleep on the box, the little horses nodding over the yoke.

At the railway station the gray morning light was beginning to filter in between the heavy stone pillars upon the



Drawn by A. H. Dumstead

A MAP OF SOUTHERN MEXICO

The State of Oaxaca, which extends from the Isthmus of Tehuantepec to the Cordilleran highlands, and embraces an area about equal to that of Indiana, is one of the richest in the Mexican Republic, but its natural resources are as yet practically undeveloped and its progress has been woefully retarded by internal discord.

throng of straw-hatted peons, Indian women carrying burdens on their heads, and sleepy, tired soldiers.

At the door was a coffee stand presided over by a gloriously clean Indian woman. The glasses in which she served coffee—a mixture of hot milk and cold coffee extract, which was kept in bottles—fairly shone, and she offered the almost forgotten luxury of napkins. Her helper sat on the stone floor by her side, fanning the charcoal in a little brazier.

"Where is the lettuce?" asked the pretty girl of Jim.

She moved through that crowd of kindly, unclean, good-natured, half-bare Indians like a vision from another world. In point of fact she was precisely that. Imagine an unmistakable American girl, dressed something like the Rue de la Paix, set against this background of soldiers and Indians in the half light of dawn.

Jim tagged after her, dressed in a nobby belted coat and fancy leather shoes, the leading strings of half a dozen Pekingese dogs run through his fingers, and heaped with packages of nightmare outline. Jim said he had the lettuce. There was more than an undertone of acid in his reply.

The gates were opened and we fought our way to seats in the dusty first-class coach of the little railroad that runs to Oaxaca. Across the aisle were the pretty girl and Jim.

A WANDERING TROUBADOUR ENTERTAINS A GROUP OF PEONS

After he has finished a song, which is usually of his own composition, the minstrel sells the printed words to his audience.

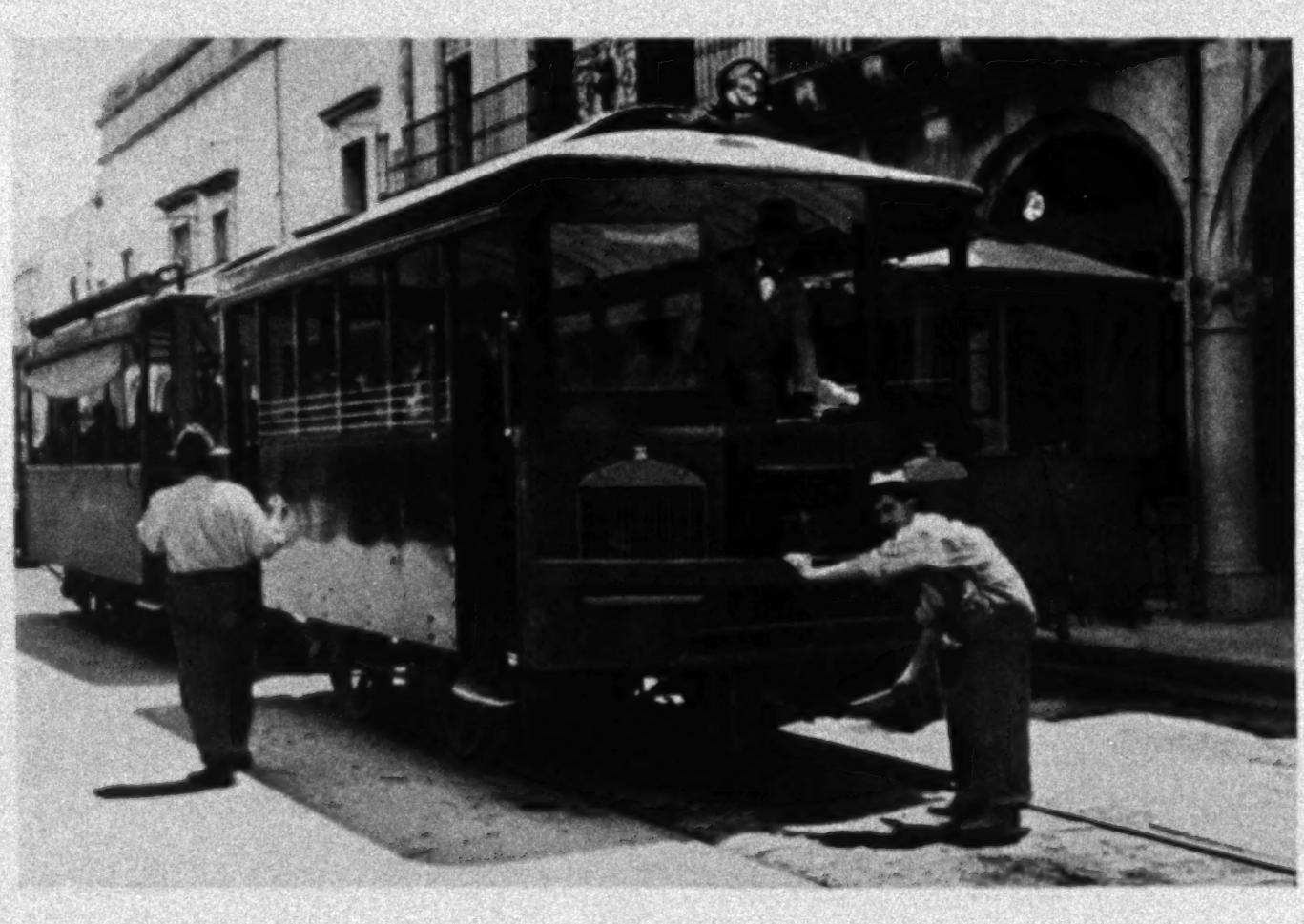
SELECTING HOBGOBLINS FOR A MEXICAN FIESTA

Imagination has free rein in the manufacture of papier-maché figures of grotesque design, which are sold in market places during Holy Week. Various pieces of fireworks attached to the figures are set off at night for the amusement of the children, much like our July 4th pyrotechnics.

Photograph by Hugo Brehme

POPOCATEPETL REARS ITS CREST ABOVE THE CLOUDS

Mexico's most famous volcano (whose Aztec name means Smoking Mountain) rises to a height of more than 17,800 feet. It is here seen from the snowclad triple summit of Ixtaccihuatl ("White Woman").



PUEBLA OPERATES ITS TRAMCARS WITH FORD ENGINES

This substitute for mule-power on the traction lines of the city was initiated by a young Englishman. To insure adequate cooling, each car has two radiators, which are sometimes located on the roof instead of the dashboard; then, when they boil over, the passengers may get a hot shower bath.

Photograph by Sumner W. Matteson

MARKET DAY AT CUERNAVACA

The market square on the right overflows to the street on all sides. The Indians are offering for sale bananas, mangoes, guavas, and many kinds of vegetables, which they grow on their small patches of cultivated ground surrounding their huts.

THE CROWNING GLORY OF THE "CITY OF THE ANGELS"

Puebla's cathedral dates from early Spanish colonial days and ranks as one of the largest and most beautiful, architecturally, on this continent. The twin towers, 240 feet high, are capped by lanterns covered with red and yellow glazed tiles, and the dome reflects a greenish gold light.

The train started and each passenger made himself a nest of his baggage, in the heart of which he sat and smoked busily.

GOLDEN PICTURES THROUGH DUSTY WINDOWS

Dust poured in through the opened windows and the beer peddler ran frantically up and down, trying to keep up with his orders. Coats were taken off and collars unbuttoned, and it appeared that each fellow-passenger had at least one revolver.

Whenever the pretty girl looked up, a score of waiting faces broke into heavenly smiles. She stared at them blankly.

Through the windows one could see the snowy heads of Popocatepetl and Malintzin, cloudlike among other clouds, against the infinite blue of the sky. The ruins of haciendas that were half farm and wholly fort, graceful stone bridges built by the old Spaniards, and the faint tracing of an ancient military road appeared.

The brown landscape glittered with the domes, tiled in steel and silver, of the

churches established hereabout by the Dominican friars of the sixteenth century, who did their best to create local industries here. Even to-day one or two of the twenty potteries they built in 1600 are intermittently operating—between wars and bandits—and the Puebla tiles are a staple all over Mexico.

ODD EDIBLES OFFERED BY ROADSIDE VENDERS

We came to a station that for three centuries has been known for the quality of the blue steel, silver inlaid spurs made by Indian smiths in dark hovels. This was likewise a Spanish-made industry. The peddlers offered them vociferously through the open windows, reducing their prices with each refusal.

Another station is known as the place where the tamale was invented. The yellow dust alongside the train was thickly carpeted with generations of the discarded corn husks in which this delicacy had been wrapped.

One can buy tamales anywhere in Mexico, but one does not touch the gastronomic heights until one has eaten a molé, based either on chicken or turkey, which includes twenty-two ingredients and demands two days' cooking and sears the tender lips of the unused Gringo to a crackling brown. Chili con carne, however, is unknown to the Mexican. Chili is pepper and carne is meat, and meat is never cooked without pepper. So much for the material of the dish; but the name seems to be as unauthentic as chop suey, which has never been heard of in China.

MAGUEY WORMS ARE A RARE DELICACY IN MEXICO

We came to a station where scores of Indian women, bare-armed, brown-bosomed, bright rebosas thrown coquettishly over their glossy braids, fairly danced along the trainside, offering coffee and delicious sweetened biscuits and thumb-sized, white maguey worms.

We turned our eyes inside. Maguey worms are as indubitable a delicacy as

LUCÍA BEAMS UPON A LANGUISHING BEAR

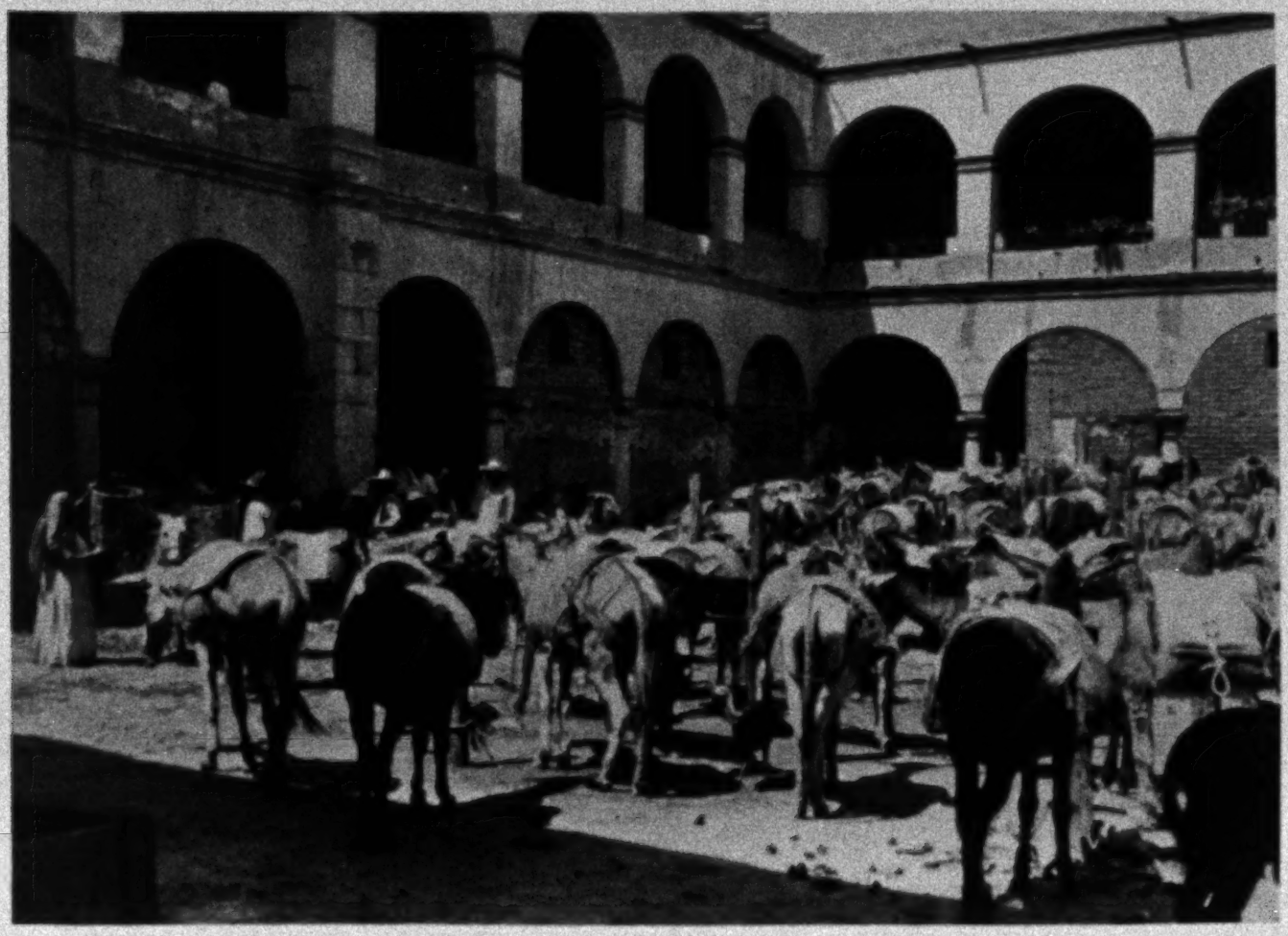
From her balcony she looks into the street below, where her admirer is "playing the bear," as the enforced long-distance courtship is popularly called in Latin America.

A MEXICAN HITCHING POST

Juan's first responsibility after reaching the market early in the morning with a load of corn is to hobble his burro.

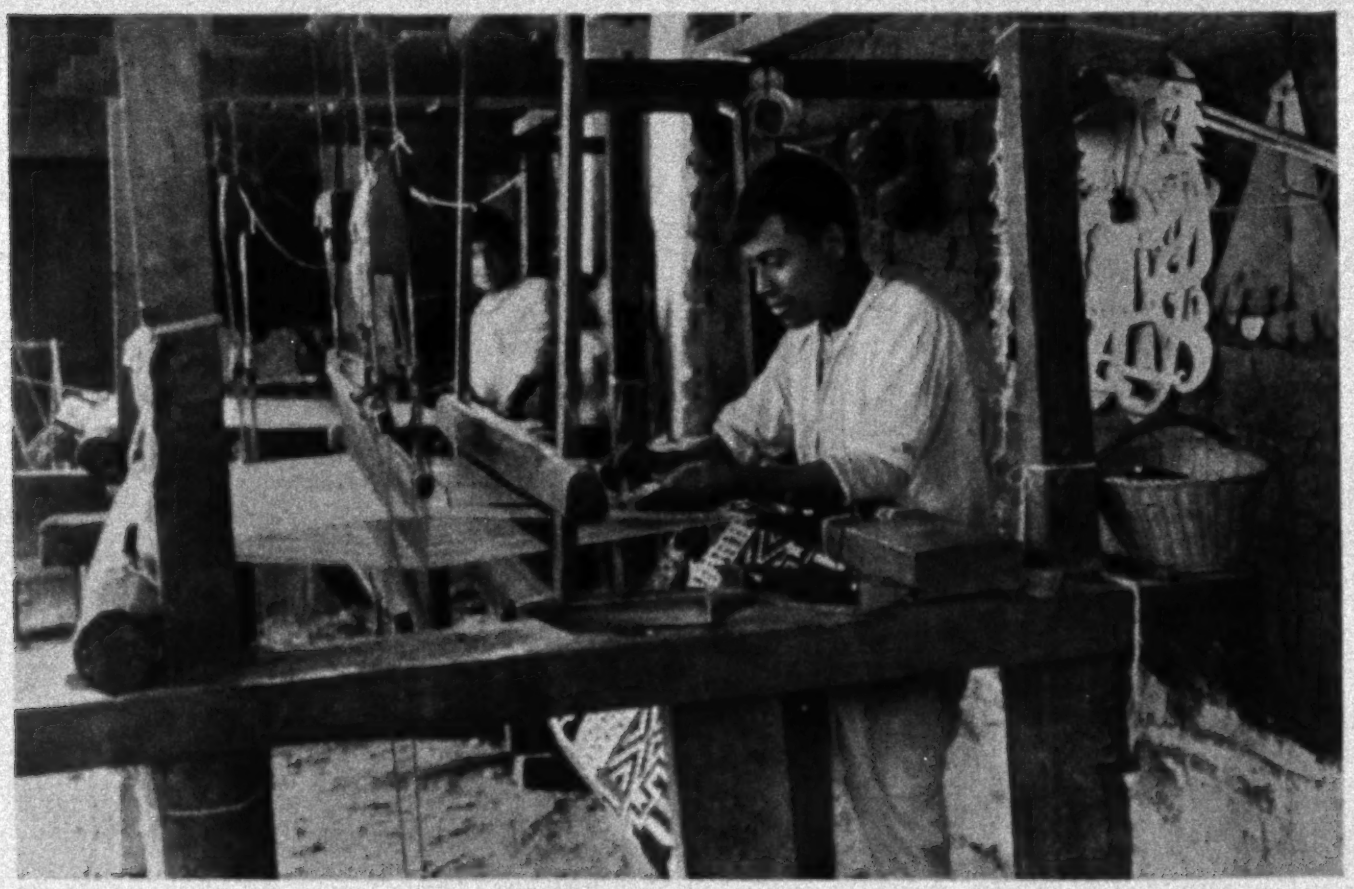
SHE BOILS, BROILS, AND STEWS IN HER OPEN-AIR MARKET RESTAURANT

Everywhere is food simmering in earthen pots, big and little, over smoldering fires (see, also, text, page 531). Almost every dish is hotly seasoned with condiments of various kinds, especially the inevitable chili.



THE INN'S PATIO TAKES THE PLACE OF THE GARAGE IN OAXACA

This courtyard, crowded with mules and pack gear, has its counterpart in our now vanished "livery and feed stables," and is always congested on market days.



BOTH MEN AND WOMEN ARE EXPERT WEAVERS OF SERAPES

The paper forms hanging on the wall are patterns placed on the serape, or blanket, as it is being woven in the hand looms and the design is followed in the colored thread, to be seen on the small bobbins at the weaver's left hand.

FROM SUNUP TO SUNDOWN SHE WEAVES BASKETS IN THE MARKET PLACE

are the snails of France, but they are of an unapproachable horror to look at. Hungry travelers all along the train bought them frantically through the open windows. We were rescued from delirium when the pretty girl asked Jim what he had done with the rabbits. We began to tot up Jim's responsibilities—lettuce, Pekingese dogs, rabbits; the mystery saved us. The pretty girl told Jim bitterly to take his feet off the goldfish.

GUARDS SLEPT ON ROOFS OF CARS

At Tepeaca the great brown bulk of one of the churches erected by Cortez soon after the Conquest dominated the dusty little town. On each station platform was a squad of soldiers, drawn up in what approximated a line. Sometimes they wore soiled cotton caps and sometimes rusty straw sombreros, and their canvas uniforms were dirty and ragged and their feet bare or sandaled at the very best.

The discipline seemed to be of a sketchy sort, too, as they lopped from one foot to the other, leaned their guns this way and that, and chatted companionably with the station loungers.

On the roof of the express car ahead slept the guards, whose duty it was to protect the train against bandits. Their sun-blackened feet swung pleasantly over the edge of the roof. Inside the car, which was filled with presumably precious articles, including ice wrapped in straw mats, other soldiers slept. They protected themselves against thieves during their slumber by twisting the straps of their guns around their necks. It was noticeable that the rifles seemed to be clean and in good order, and that their officers were a snappy lot (see, also, page 523).

Sometimes the rattling little train stirred up such a tornado of dust that even the Mexicans were forced to close the car windows. Then we dissolved in the furnacelike heat.

Before noon we had dropped more than a mile from the level of Puebla. Date palms began to appear and the wide, pale-green plumes of bananas flourished along the watercourses.

ONE CORNER OF THE OAXACA MARKET IS ALLOTTED TO PALMLEAF PRODUCTS

The venders of the different kinds of merchandise gather in groups. There, the women sell the soft, thick cotton cloth made in the Mexican mills, and here baskets of every sort, from curiosities into which one could hardly slip a grain of wheat, and yet which the magnifying glass shows to be perfectly woven, to baskets the size of a barrel. One can buy the reed mats on which one sleeps in the Indian huts or one of the innumerable varieties of reed sacks—something like the bags in which American children sometimes carry books to school—or hammocks or fiber ropes.

Huge cacti of a score of sorts promised punishment to the unwary, and those of organ-pipe shape served here and there as fences. Indian women sold cactus buds to the hungry for a centavo each. We found that they looked like pale raspberry jam inside and tasted like cactus buds.

Peddlers offered pottery toys, such as whistles, birds, bullfighters, and muleteers. The subjects were always taken from the scenes of daily life, and for the most part the little effigies were most artistically done.

THE GORGE OF TOMELLÍN IS MAJESTIC

As we descended into the hot country the human envelope became more scanty, so that the men went about bare-legged, the black brown of their skins set off sharply against the white of their cotton clothes. The women displayed rounded arms and opulent breasts with nonchalance.

The emerald valleys became more narrow as they succeeded each other, set in ever-closing rims of bare brown rock. At last the mounting hills shut off our view of that faint, almost indistinguishable, yet unchangeable, bubble in the sky which was the peak of Orizaba (p. 547).

The strata of the rocks began to twist and agonize until we came to the opening of the canyon of Tomellín, which for forty miles is a fair rival of Colorado's Royal Gorge. Because of this almost impregnable gateway and the Zapotec Indians, the State of Oaxaca preserved a measure of independence through the years of Carranza's futile sway.

Halfway through Tomellín we came to the Chinaman's. No doubt he has a name, but all Oaxaca knows him as the Chinaman. One learns to mark with a white stone the places in disturbed Mexico where one obtains, outside of the larger cities, a clean and well-cooked meal.

Great pigeons flaunted over the tables

MAKING TORTILLAS

The staff of life in Mexico is corn, in the form of the tortilla. The grains are first soaked, then mashed on the stone *metate*. The resulting mush, or tough dough, is kneaded and patted into thin, saucer-sized pancakes, which are baked on iron sheets over coals. These women are natives of Puebla.

from their nests in the comb of the roof and parrots screeched in cages. The cool mountain breezes entered through the interstices in the wattled walls.

"I wish I was back in Iowa," said the pretty girl, wearily. "I've been traveling these Spanish-American countries for five years now and I'm tired. Gee, I'd like some regular pie."

She made up from what was left of her meal a sandwich, to be taken to Jim, who had been left in the car to guard the baggage. In a moment of generosity I offered to contribute a cold fried egg which had ceased to intrigue me. The pretty girl giggled.

"You don't know Jim," she said. "He hates eggs."

Four bright young women who got on board at Tehuacán, which, before the revolutionary fighting began was a prosperous health resort because of its healing waters, left the train at a little village.

MORE GUARDS AGAINST LURKING BANDITS

Their brothers—perhaps—met them with riding mules and burros for their baggage. This was at a little station the roof of which had been burned off by one of the extraordinarily industrious gangs of bandits with which Oaxaca intermittently abounds. It takes energy to make a real success of burning a house that is built solidly of stone and tile.

On the end wall the signature of one José had been scrawled, with his promise to give death to some one. A cross had been drawn in charcoal to mark where some one had died with his back against the wall. The rains had not yet washed the black dust away.

A one-legged beggar sat in the sun, half asleep, his hand mechanically stretched out. The trainside offerings betrayed the poverty of the countryside. Half-starved old women held up dirty ears of boiled dwarf corn, or oranges hardly larger than lemons, and miserable little bananas and watermelons the size of gourds.

Sometimes streams of water confined in ditches built by the long dead Spaniards tinkled through the foreground. Burro-wide trails rambled across the brown hills toward the black pines in the distance or along the edges of the green canefields. The dust was white and the sunlight harsh and yellow.

One was continually reminded of the pictures of Palestine. There were the same wooden plows used by the men of the East, the patient oxen, the bare brown bodies, and the fluttering draperies.

After hours of climbing from the lowlands, we crossed the last range of hills and began to coast down into the beautiful valley of which Cortez was Marquis.

Twice we made stops at garrison towns, where extra cars filled with soldiers were coupled on. This gave rise to rumors of wars and bandits, but no one seemed concerned. One becomes accustomed to unrest.

The crests of the hills were crowned with Indian villages, glowing in the last rays of the sun just as they did in Cortez's time. Women waited for the paymaster in long lines in front of ranch houses, each with her day's picking of coffee in a woven sack of reed.

In the Oaxaca station was a riot of *cargadores* and Indian men and women, all kindly, noisy and pushing. We took a carriage which once might have belonged to a rich Spaniard, so ornate and beleathered it was, and which certainly had never been intended for its present uses, and racketed over the cobbles in search of a hotel.

OAXACA WAS ONCE THE MOST GODLY TOWN IN NEW SPAIN

On the way we passed churches that by their beauty reminded us that this had once been one of the most religious towns in New Spain. The first convent was established here in 1529, only eight years after the Conquest. An old chronicle states that three years later "Oaxaca possessed five hundred families of pure Castilian blood."

In twenty years the first friars built 160 churches in as many villages.

Our hotel was a joy. We were escorted across the wide, two-story patio, with double galleries on each of the four sides to insure protection from the sun, to our rooms on the second floor. They were enormous—grotesque, almost frightening in their immensity. My bed-

SHOWING OFF HIS BEAUTIFUL HORSE AT A BALL GAME IN OAXACA

The *charros* are dandies on horseback who adorn themselves in elaborate attire and magnificently caparison their superb mounts for gala occasions (see, also, text, page 519).

TRAMCARS IN OAXACA ARE DRAWN BY MULES

One is for first-class and one for second-class passengers. The former has right of way from the railway station. Precedence and the amount of fare are the only distinguishable differences in the two "classes" of vehicles.

"WHITE WINGS" OF TEHUANTEPEC'S STREET-CLEANING DEPARTMENT

Zopilotes, or buzzards, are to be found in great numbers throughout Mexico. They like to loaf in the branches of dead trees.

CHOOSING A PARROT FOR HIS PATIO

These large birds of brilliant plumage do not talk, but make a peculiar squawking noise, which suggests their name—guacamayos. They are great acrobats and use the beak frequently to maintain a hold while climbing.

SHE PEEKS THROUGH CACTUS PICKETS

An Indian maid of Mitla shyly smiles at strangers beyond the "organ" cactus fence around her home.

room was forty feet by twenty, and the walls, as might be seen at the embrasures of the windows, were four feet through. Underfoot were fifteen-inch-square red bricks, worn into hollows, and overhead were foot-square beams on which rested the tiles of the roof. The door was fit to support a charge of cavalry, with its rat-tail lock inside and its padlock and staples without.

And our meals! What would we have in the morning—just coffee, and sweet bread, and toast, and eggs, and chocolate, and milk, and fruit? Why will not the Señores have biftek, because the Señores may rest assured it is of the best and not half an hour dead? At noon and night, soups and meats and Spanish dishes of half a dozen sorts, each with its flavoring of garlic!

OAXACA'S CATHEDRAL HAS BEEN PILLAGED MANY TIMES

Our evenings we spent on the plaza. The porticoes which flank it are among the most picturesque in the Republic, and a small army of peddlers of lottery tickets and hucksters of sweetmeats and public letter writers pursue their vocations beneath their grateful shade.

The great cathedral which overhangs the plaza has been bombarded and pillaged so many times that it retains but a shadow of its former beauty, and its fine altars and paintings have disappeared. Fortunately, the beautiful seventeenth-century façade remains intact, embellished by some forgotten artist's remarkable sculpture.

Here one wore a coat for courtesy's sake only. It was not needed in this perfect climate. In Oaxaca City the mercury moves within a range of 13 degrees the year round, and the rains are so regular that one may almost set one's watch by them. One of the best brass bands I ever heard played until the closing hour of 9 o'clock, by which time one was ready for bed anyhow. This band was featured at the St. Louis Exposition and has grown in grace each year.

The plaza pictures delighted the eye. There were the army officers on duty, this fact being advertised by silver half-moons strung about their necks, and items of the thirteen Indian tribes of Oaxaca, from the half dwarfs that come staring in from

LIVE CACTUS FENCES

The organ cactus resembles the pipes of an organ and is much used in some parts of Mexico for fence posts. Its thorns and saw edges make a barrier such as this almost impenetrable.

the jungles of the Isthmus to the stalwart and intelligent Zapotecs of the hills. There were riders in *charro* costume, with skin-tight riding breeches, the seams strung with silver buttons, and steeple-crowned hats in every color adorned with appliqué work in silver and leather (see illustration, page 516).

A little boy passes on an errand for his mother, clutching a key almost the size of a fire shovel. Dandies strut by in English riding clothes, the tails of their smoothly ironed coats thrust out by the ivory handles of pistols. Indian women sail along, erect under their head burdens, and half-grown boys and girls sleep in doorways.

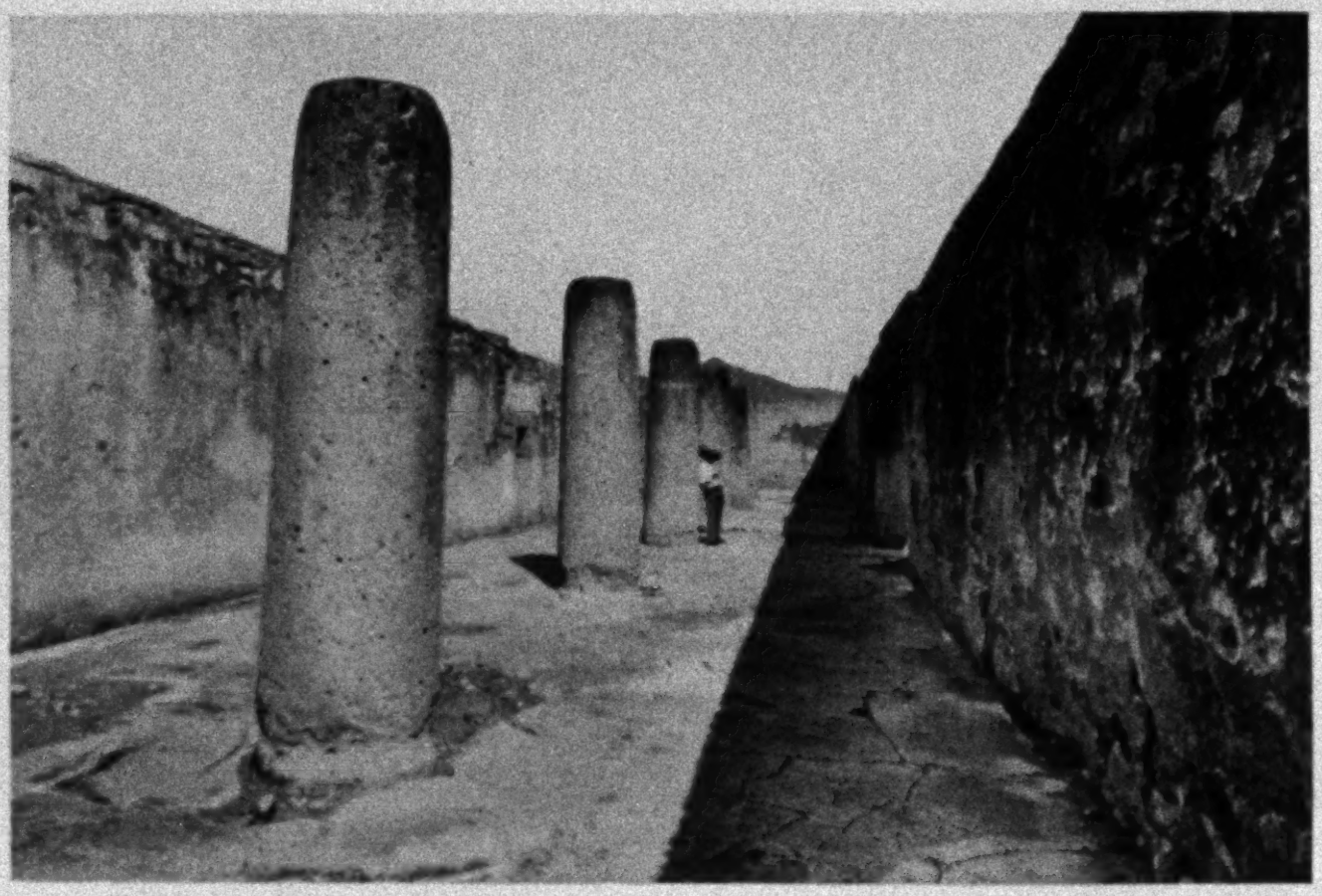
Pretty women, with their maidservants dutifully trailing one step behind, and pretty girls, looking neither to the right nor the left, guarded by their duennas. Swarthy, spur-heeled, bepistoled *rancheros* accompanied by their women, demure under their rebosas. An occasional American or German. A jingle in the street and the flash of a sleek horse and a silver-mounted saddle.

Then back to the hotel, to hammer with the iron knocker until the blanketed guard who sits inside the door wakens to let one in.

THE MYSTERY OF THE PRETTY GIRL IS SOLVED

One night we went to the theater—an excellent one, marble-fronted, and in every way a credit to the mountain city. Four galleries rose over us, and in the row of lower boxes sat the descendants of the 500 Spanish families which located here in 1532. Evening dress was de rigueur.

The young bloods in the pit rose at their seats between the acts and unhurriedly inspected the beauties in the boxes. Here and there a young gallant "played bear" in a box, advertising the hopeless passion that consumed him. The truest chivalry was shown when the swain refused even to look at the stage. The



NORTH AMERICA'S BAALBEK: THE HALL OF MONOLITHS IN THE RUINS OF MITLA

These six large columns, three feet in diameter and fourteen feet in height, are supposed to have been created not for architectural impressiveness, but for the purpose of supporting the ceiling and roof. The lintels over the doorways of some of the rooms are cut from solid blocks of stone and are from four to five feet square, and fifteen to eighteen feet in length.

duennas interfered only when the young people threatened to hold hands.

"Look!" I said to my companion. "There is the pretty girl with Jim."

A Chinese juggling turn was the headline act of the evening, and the pretty girl teetered in, as Chinese damsels do upon the stage, clad à la Chinoise. That seemed to be her only part in the entertainment. She just teetered and looked pretty.

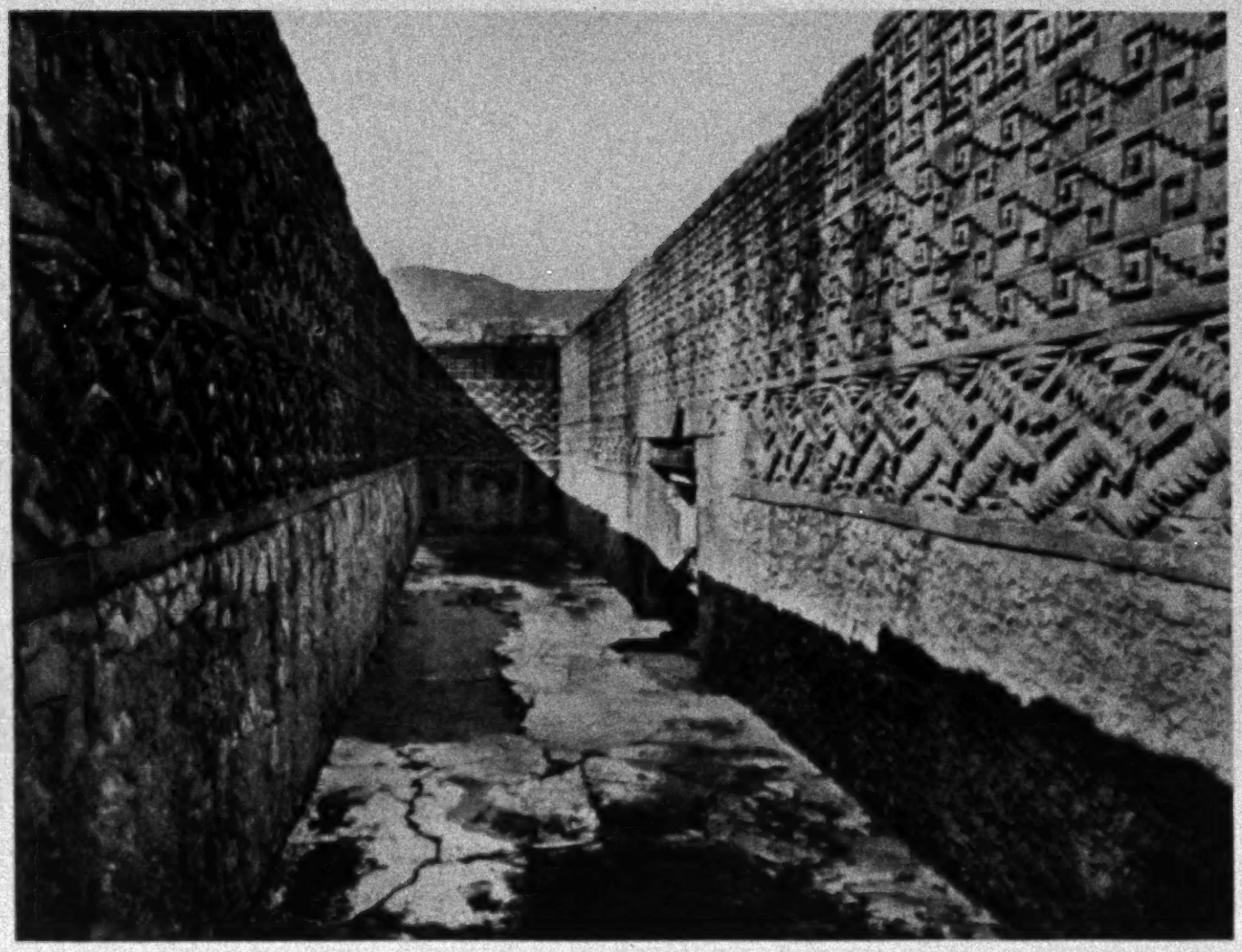
Jim followed, morose as usual, to move chairs and hand goldfish to the juggler. When the magician broke eggs to prove that they were real, Jim caught them in a hat. After the performance we discovered Jim decanting these eggs into a basin for breakfast.

"I hate them dum eggs," said Jim, passionately. "I wisht I was back in Nicaragua. I was a sucker ever to get fired from the Marines."

One feels that the Conquistadores have not fully relinquished their hold upon Oaxaca. It is not what it was when the Spaniards ruled, of course, when the treasures of the hills were being sacked and the villages were more numerous and populous than they are to-day; but it is almost its old self in appearance. One has but to step around the first corner—get out of hearing of the railroad engine and of the rattle of the mule car and out of sight of the electric light—to leave the twentieth century.

There are plazas, palm-shaded, each with its fountain, and green, tangled, flower-filled parks, and one glimpses delightful gardens through half-opened posterns. The houses are low and massive, of a Spanish-Moorish architecture, designed to resist equally well earthquakes and mobs, both of which are common to the city. The timbered doors are crossed with thick steel bars.

The church bells are soft and melodious, for Oaxaca was once the most godly see in New Spain, and the faithful were called to prayers by bells of gold and silver bronze instead of by the compulsory



WHERE PRIESTS OF AN ANCIENT CULT ONCE TROD

The heavy stone lintel of this ornate passageway in the ruined temple at Mitla (see text, page 532) indicates that the prehistoric architects had not developed the arch. The million (estimated) stone slabs or tiles, about one inch thick, used in the mosaic decorations were hewn from the quarry and shaped with stone hatchets.

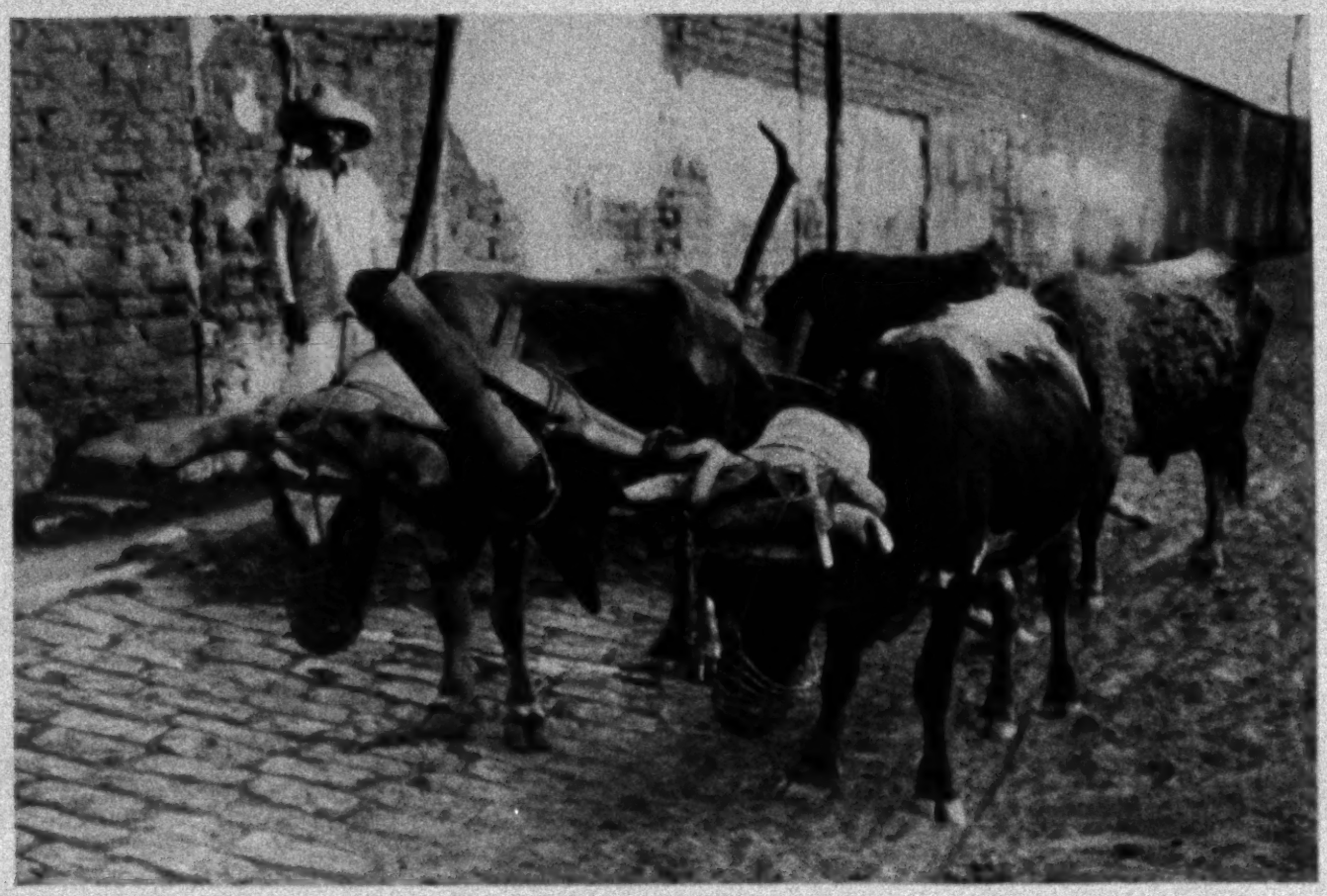
means employed with unbelievers in less kindly towns. The streets are paved with the cobbles of colonial times and there are legends everywhere. Cortez once had his palace here; Alvarado did this; Sandoval did that.

A daughter of Montezuma—really a great-great-granddaughter, of course—still lives in Oaxaca on a pension paid by the government.

No State in Mexico was more barbarously rich in precious metals when the Spaniards came. It is rich even yet, of course, for its mines have scarcely been tapped. Hardly a day passes that some little family of Indians does not drift in from the bush with raw gold to sell to the traders. Sometimes the gold comes in the form of little balls mixed with the amalgam and quaintly decorated by the impress of the threads of the sacking in which it was caught; sometimes in rough plates and medallions, rough from the heat and streaked white with silver. The Indians never tell where they find the metal. Their experience in generations past has at least taught them to hold their tongues.

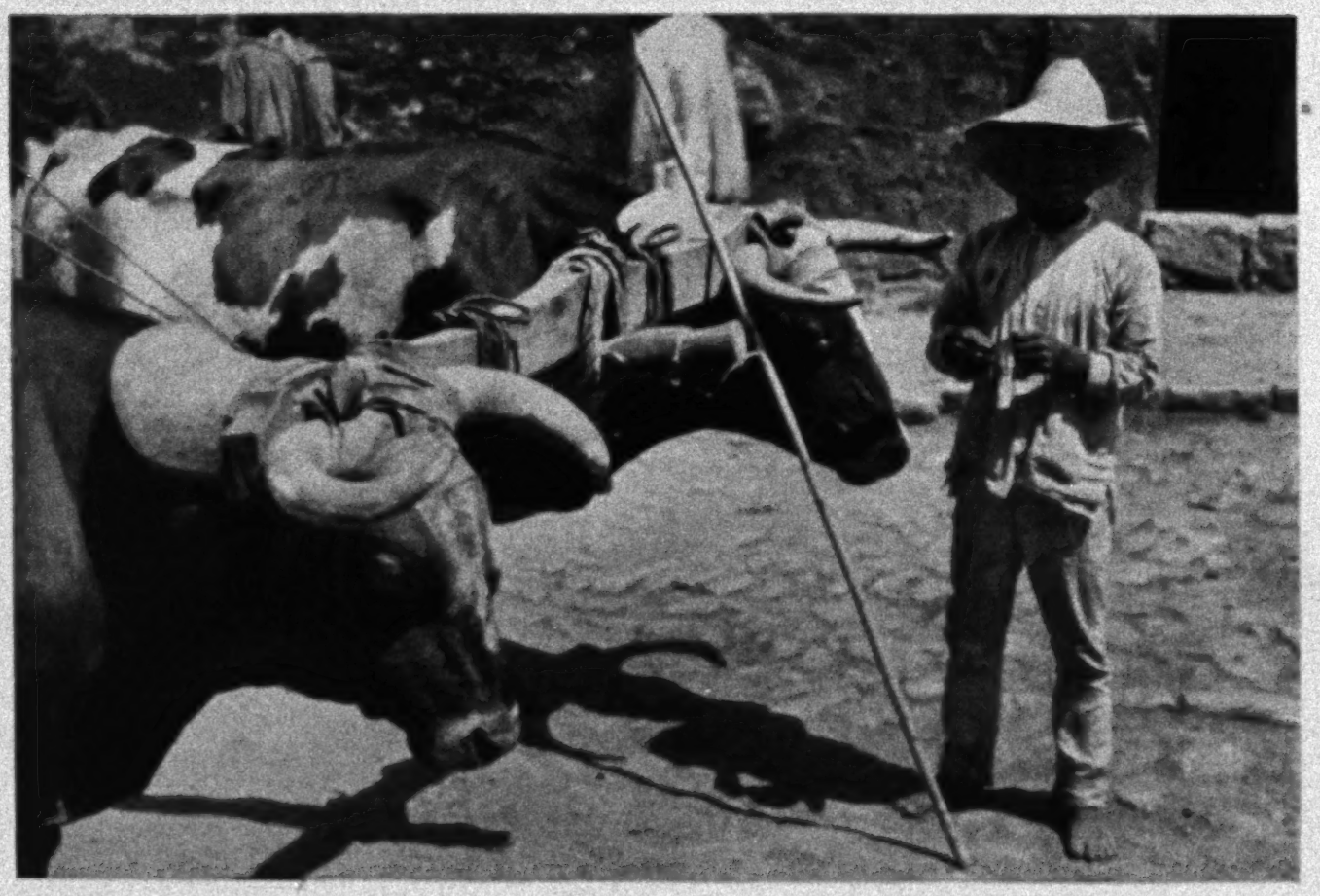
CHURCHES ONCE PLATED WITH PRECIOUS METALS

There are other treasures, too. The huge church of Santo Domingo was once described as the most superb example of baroque architecture in Mexico. The great barrel-arched ceiling was covered with heavily gilded ornaments and polychrome sculpture in high relief. "The scheme," said an authority, "in the domed vaulting of the organ loft ceiling may be compared to an enormous tree, extending in all directions its branches and its innumerable leaves of gold, between which appear the busts of saints, diminishing in



HOMEWARD THE PLOW BEASTS PLOD THEIR WEARY WAY

The heavy wooden plows of Mexico have steel points and are thrown over the yoke to be carried to the farmyard or patio for the night (see illustration, page 530).



TRAINED TO OBEY

The Indian boy holds his oxen immobile by leaning the goad against the yoke.

TRAIN GUARDS TAKE A HALF HOUR OFF FOR LUNCHEON

These soldiers lead a carefree existence and seem to eat where and when they can find food. A vender of tamales has just sold lunch to this group, which is part of the detachment guarding the passenger train on which the author and the National Geographic Society's staff photographer traveled from Puebla to Oaxaca (see, also, text, page 512).

size as the height increases, until at the apex only the faces are shown. The effect is one of indescribable splendor."

Looters have mounted on ladders and scraped off the gold as high as they could reach. An aim of at least one of the parties in each of Mexico's wars has been to plunder the churches. This process began with the fight for independence, in 1810, and continued until plundering ceased to pay.

Treasures are often found in the walls of old houses at Oaxaca. The priests and friars, faithful to their trust, concealed the gold and silver vessels when that was possible. One by one the custodians died and the knowledge of the hiding places died with them. So it happens that from time to time an old house is pulled down or crashes in an earthquake, and in the crumbling brick of its walls the forgotten gold is found.

STRANGE TRAILS OF THE OAXACA JUNGLE

Trails lead out into the bush, for Oaxaca City is the metropolis of Oaxaca State, which contains perhaps a million souls and covers 35,000 square miles. Mule trains, with their little bells tinkling, wander in for supplies for towns whose names are not to be found on any map. No more enticing wilderness remains in Mexico, if one may trust the tales one hears. In part it is wholly unexplored.

"I have been in a part of the unexplored territory," one American said. "No; no adventures, nothing happened; just the usual thing. Snakes everywhere, especially boa constrictors, and wild hogs, and birds, and game of all sorts. Too many alligators and creeping things in the bayous to make swimming across them a pleasure. At night the jaguars used to ramble through our camp, and we saw their eyes shining in the firelight. But nothing happened."

At Juchitán is the home of the Tree of the Little Hands, with its beautiful red flower, the center of which is in the form of a hand with the fingers turned inward. The natives venerate it as though it were a god. Centuries ago thousands of lives

COMPLETING A HAMPER JOURNEY

Sometimes the Indian mothers ride all the way to the market carrying the smaller children in the great bamboo baskets containing vegetables and fruit.

were lost because a Mixtec chief refused to send a tribute of these flowers to Montezuma of the Aztecs.

The cochineal industry originated here, at the little Indian village of Cuilapán. From Oaxaca the Spaniards carried these curious little dye insects to Guatemala and the Canaries. Nowadays even the Indian blanket makers have abandoned them and rely on aniline dyes.

UNDER DIAZ THE STATE PROSPERED GREATLY

In the closing years of the Diaz régime the capital of Oaxaca bustled with business. Mining offered but a small part of the State's possibilities. Every range of climate may be found, from the north temperate on the slopes of Zempoaltepec, from whose summit one may see both the Atlantic and the Pacific waters, to the Tropics, on the Isthmus of Tehuantepec. There are magnificent tropical forests at the foot of the slopes and great pine woods near the summits.

The humid valleys between the hills are gardens of beauty. Countless varieties of trees are to be found in Oaxaca, including dyewoods and the fine, hard-grained timber for cabinet-making. Coffee, indigo, vanilla, cacao, rice, sugar cane, and corn are common crops, and oils, fibers, half a dozen metals, marbles, onyx, and salt occur in commercial quantities. The fruits, the flowers, and the medicinal plants are innumerable. The prospect of prosperity ahead seemed boundless.

Then the war of the revolution came and progress ceased. To-day there are almost no mines open, and one might say that there are none in operation.

Nowadays there are scores of little wars going on between neighboring pueblos. Grudges that date back to Montezuma's time—feuds so old that not even tradition accounts for them—have been revived. This was precisely the state of affairs before Cortez came.

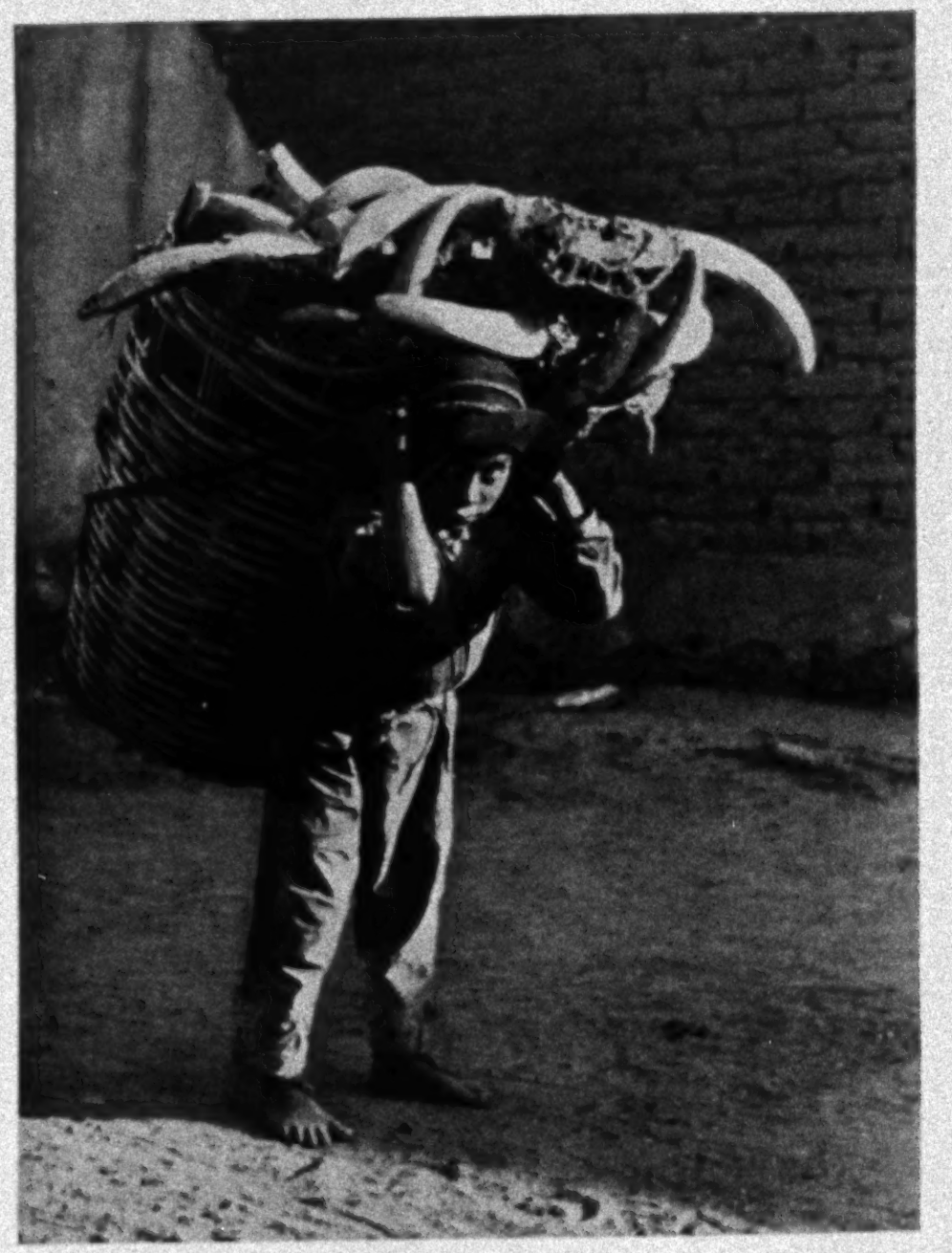
The State knows of these little wars, but knows little about them, for the dead are buried by night and the wounded are hidden. The Indian does his best to keep his affairs separate from those of the whites. He does not consider himself a

JUST ARRIVED IN OAXACA FOR THE MARKET

José is too small to walk all the long distance from his home in the mountains, perhaps 20, 30, or even 40 miles away, so big brother Manuelo has let him ride the gentle burro, perched between the baskets of vegetables that are to be sold. Usually the whole family comes along, for marketing is not only a part of life's business, but it is a social event of the utmost importance.

BABY GOES TO MARKET PICKABACK

With her infant slung safely on her back in a shawl, or *rebosa*, the Indian mother stops to ask the price of tortillas in the basket.

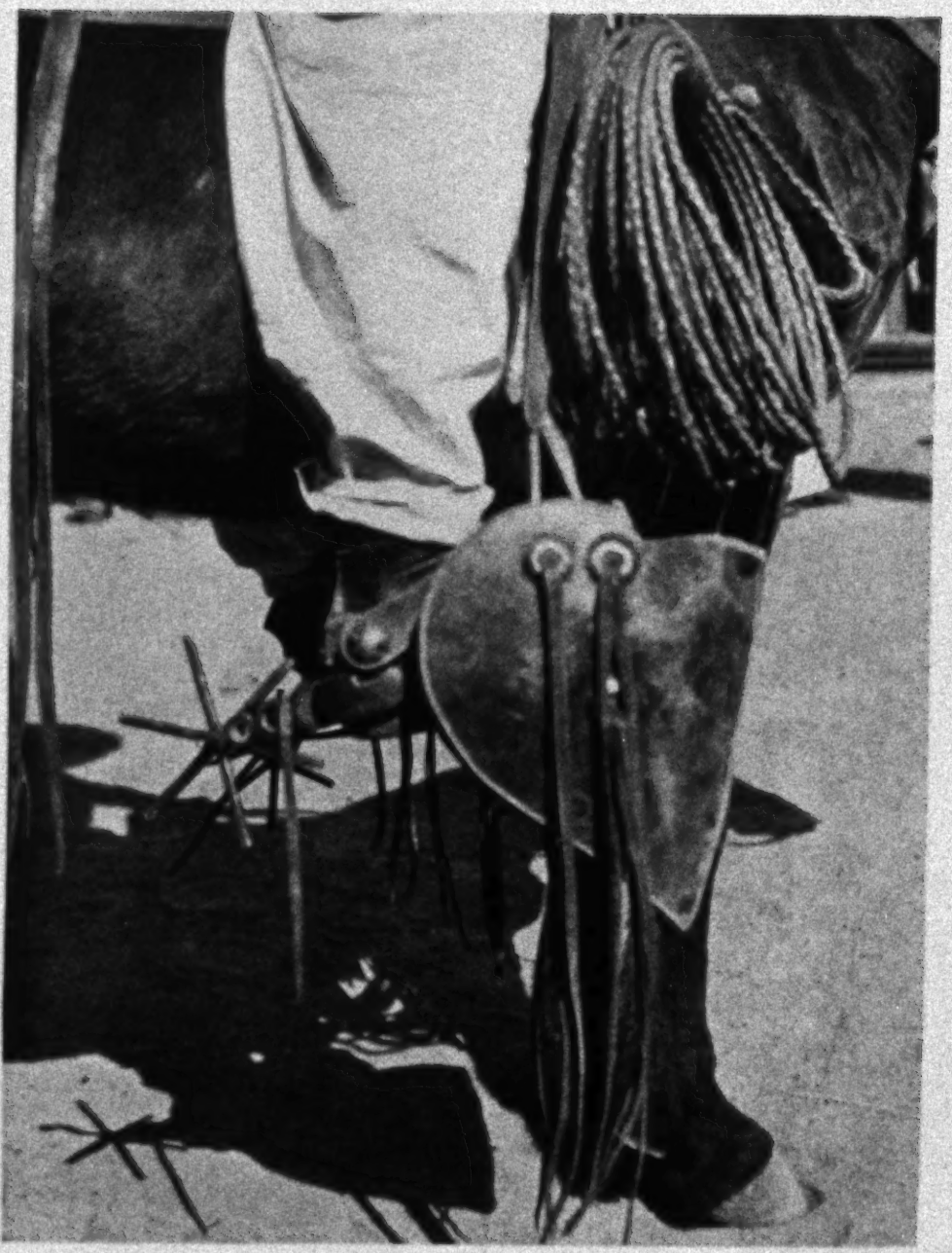


"WHO WANTS TO BUY A LOAD OF OX HORNS?"

In a large Mexican market the shopper can find a bewildering variety of articles suggestive of the so-called "thieves' markets" of the Old World.

SHE WEARS HER ONION WARES IN THE OAXACA CITY MARKET

The Zapotec women are of magnificent physique—lithe, slender-ankled, full-bosomed. As a rule, they are modest and dignified.

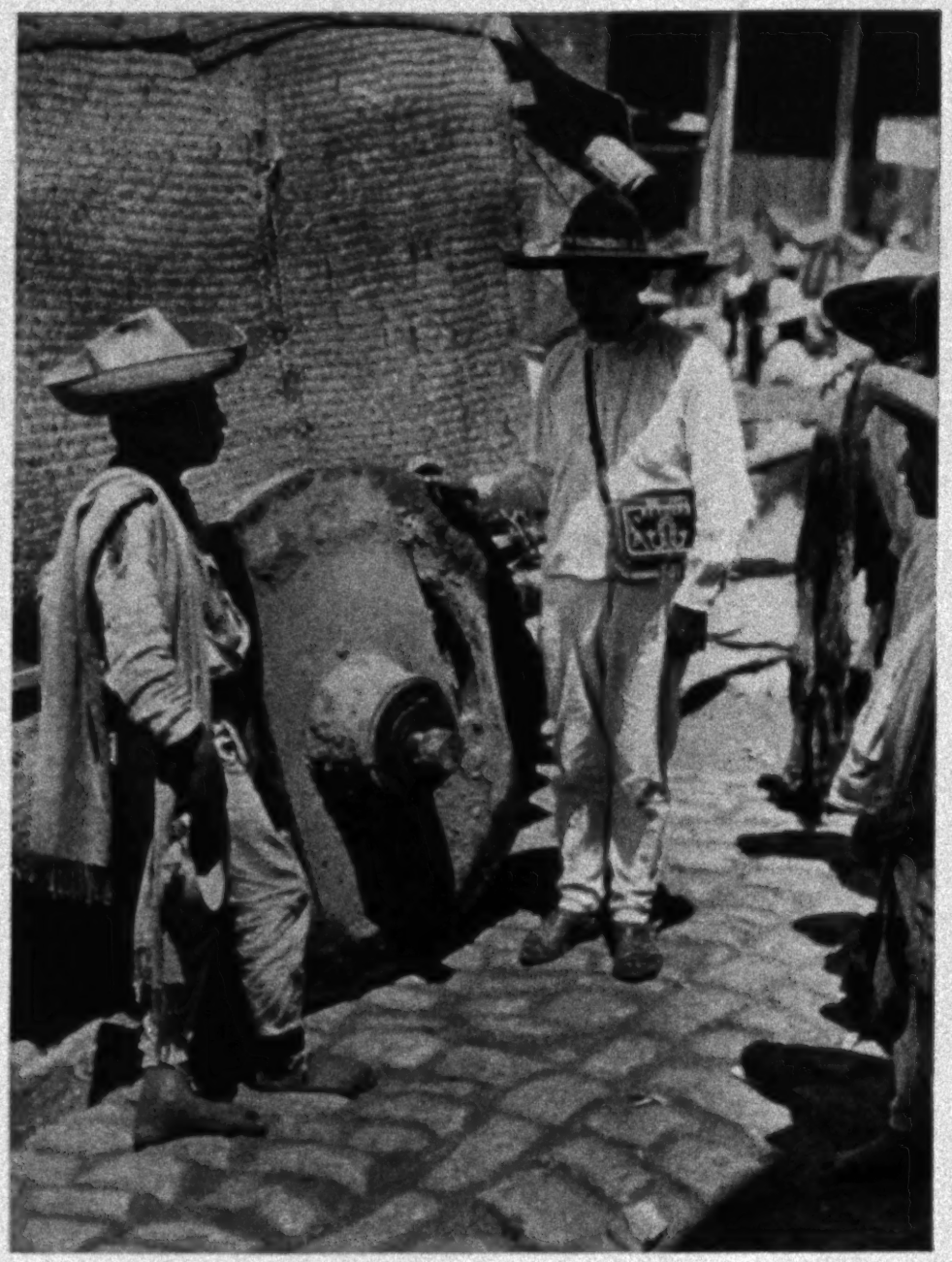


GIANT STIRRUPS AND SPURS FOR A LILLIPUTIAN PONY

Hernán Cortez and his followers are credited with having introduced the ancestors of the small but hardy Mexican pony into America.

TOOL KIT AND SEWING OUTFIT WORN ON HIS HIP

The husky Mexican porter, who carries sewing machines and pianos on his shoulders, always keeps his knife, scissors, needles, and twine handy.



A FORERUNNER OF THE AUTOMOBILE STEEL WHEEL

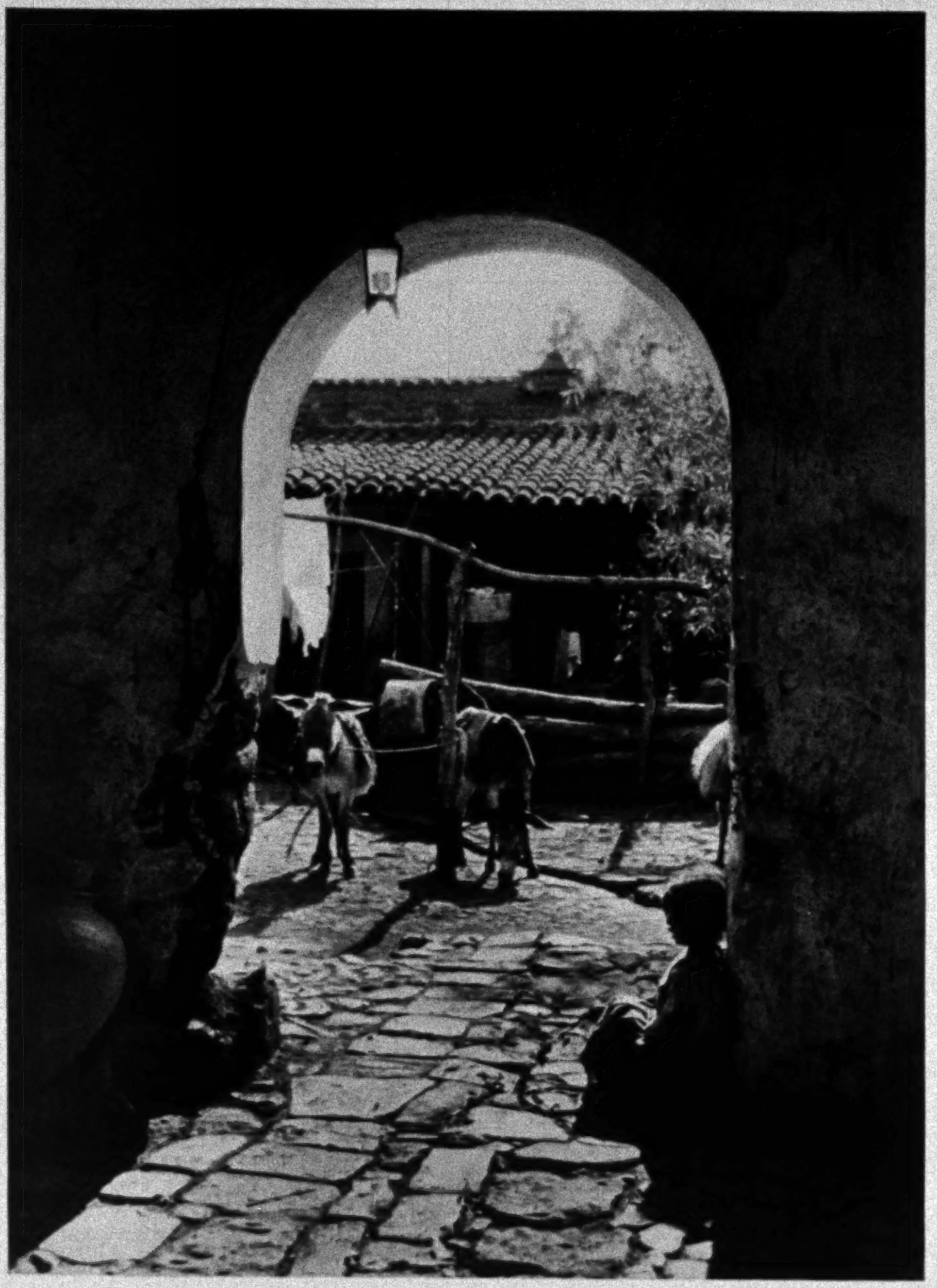
Most of the Oaxaca oxcarts have solid, massive wheels hewn from a single block of tough mountain wood. Some of the Indians carry bags of fancy leather, such as that worn by the man at the right.

FATHER GOES SHOPPING

He has borrowed mother's shawl to help hold the baby, for mother is the better bargainer of the two and the man must carry the child during the family's procession through the Oaxaca market.

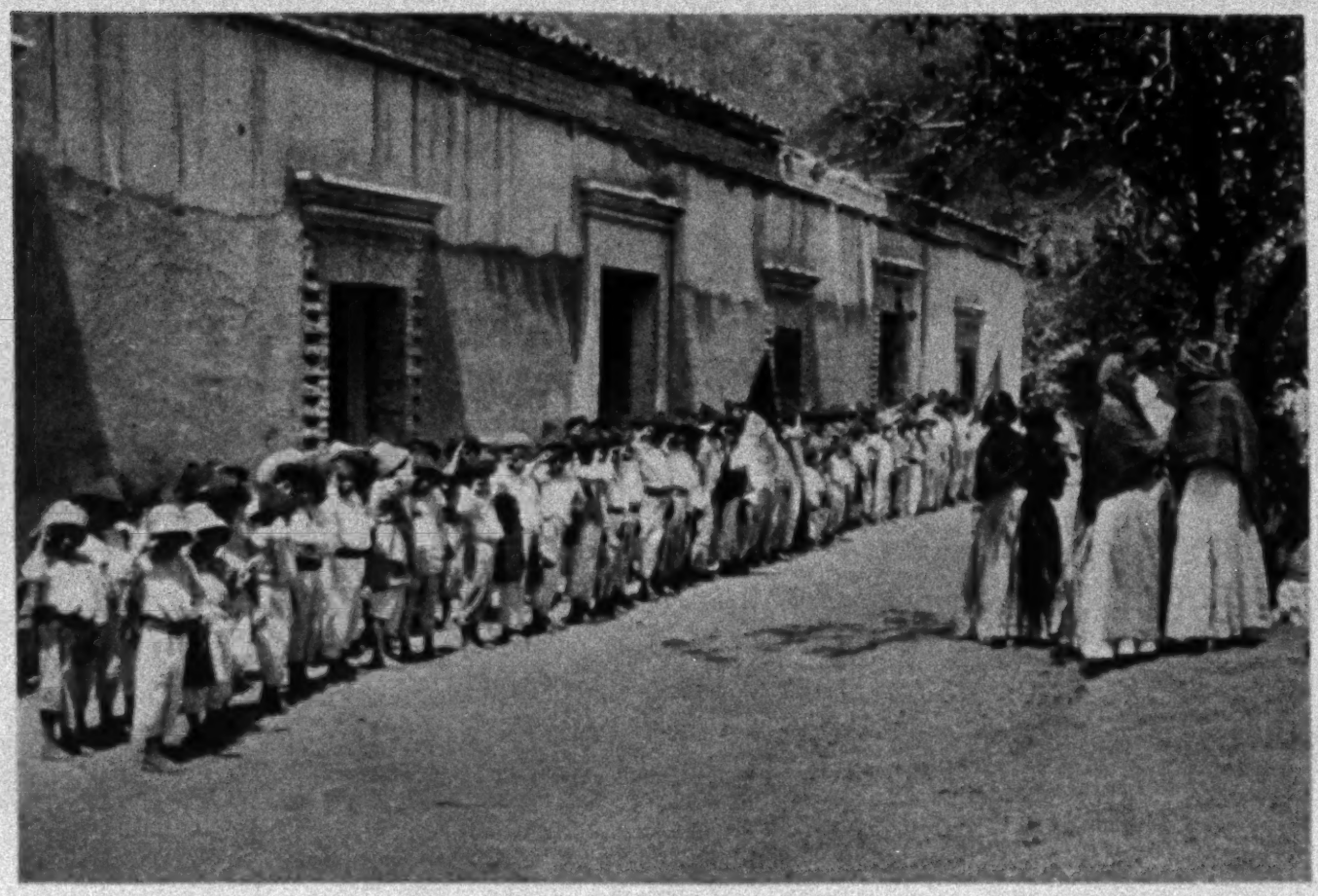
TIME NODS AWHILE IN A OAXACA SIDE STREET

In the cool of a lazy summer afternoon the women of the neighborhood come to the little fountain to get water in their *ollas*. The heart of every town is the basin of the main fountain, in which men and women and children wash themselves and their utensils and vegetables, and from which they draw water for cooking.



THE SUNLIT PATIO OF A MEXICAN FARMER

Casual glances into arched doorways in Oaxaca are likely to reveal innumerable evidences of Mexican rural life. In the outlying parts of the city the residents are farmers, who by day till the adjacent fields and at night keep their farm animals and implements in the patios of their homes.



YOUTHFUL FELLOW TOWNSMEN OF MEXICO'S LAW GIVER

These Zapotec school children, eager to honor the memory of the great man of their race, are awaiting the arrival of the Juárez birthday procession from Ixtlán (see, also, illustration, page 551). So anxious is their tribe for knowledge that the men of the village voluntarily rebuilt the schoolhouse after it was burned by revolucionistas (see text, page 553).

Mexican at all. He is a Zapotec, or a Mixtec, or what you will. His loyalty is to his village and not to the Mexican State.

In many pueblos no Spanish at all is being spoken. Because certain communications with the State are enforced, it is the habit in many of these villages to send a bright young man to Oaxaca City for instruction in Spanish. When he returns to his village he becomes the secretary to the Presidente and the diplomatic link with the outside world. The one aim in which all Indians are united, according to the white men who have been with them for years, is to be as nearly the Indian of prehistoric times as possible.

INDIAN MARKETS ARE PAGEANTS OF COLOR

During the mornings of our stay in Oaxaca we usually visited the markets, where every sort of Indian manufacture was offered for sale. The stores of the city deal in imported goods only; but if one needs a serape, or a few pots, or baskets, or leather goods, or food, one goes to the central market house, built a few years ago by an American firm.

Everywhere is food—broiling, baking, roasting, boiling in little earthen pots over little fires—and chattering Indians eating a centavo's worth of mysterious messes. The butchers hang their meat on racks, out of reach of the dogs, but well within range of the flies, while the hangers-on of the industry—one might call them dealers in secondhand meat—sit on the cobbles with pots full of half-rotten scraps for sale by the handful.

Coffee and rice and beans are displayed for sale on mats spread on the ground and are weighed out almost by the teaspoonful.

In one corner are the serape sellers, squatted together in phalanx, each with his stack of white and red and black and red and gray and red blankets. Each has trotted in, bent double under a muleload of them, and with those that are not sold will trot out again at night.

Teotitlán, where is the cave in which the Spirit of the Shadows spoke to the

men of old, is the place where the serapes are made. One gets a glimpse of the old-time communal life in such villages. None were ever quite sufficient to themselves, evidently, but collectively provided for every need of the countryside. No doubt the men of Teotitlán might have baked pots and woven rope as well as the men of their neighboring towns, but they did not. A self-contained village might not have been nearly so joyous.

The markets of to-day are by no means the invention of the Spaniards. They were held by Indians centuries before the white men were ever heard of. The serape makers from this village, and the potters from that, and the cloth weavers from over yonder met to trade and talk. It was this need that created the plazas around which each Indian village centers. Until the coming of Maximilian and Carlota, the plazas were dry, dusty, treeless squares, utilitarian in purpose and appearance. It was Carlota who compelled the planting of trees in most of the Mexican plazas during her brief play at being empress.

ON THE ROAD TO TEOTITLÁN

The road to Teotitlán was dotted with moving figures bound for the Oaxaca City market. A great oxcart creaked toward us, preceded by a Juno of a woman. Stern, high-headed, big-chested, she was, in an Indian way, beautiful, even if she was blackened by sun and dust. The picture she made haunts the memory, as she swung along at the heads of the two great black oxen. The cart was piled high with sacks of coffee, and under a little canopy in front crouched father, a wizened, timidly grinning little man with two babies in his arms, while other urchins peeped from niches among the sacks.

At Santa María del Tule we saw the Great Tree of Tule. It is one of the natural curiosities of which every one in Mexico knows, though few have seen. Hernán Cortez and his men took shelter under it on their march to Honduras. Baron von Humboldt was so impressed with it in 1803 that he wrote his name and an appropriate inscription on a wooden plate and nailed it to the great trunk. It is now overgrown by the bark, so that only an inch or two of the plate may be seen, and the words are wholly undecipherable. The tree is a cypress, 170 feet high and of so great girth that thirty persons with finger-tips touching can barely encircle it.

As old as the Great Tree of Tule was the trumpet song of the Indian who leaned over the battlements of the quaint little church named in honor of the great tree, and under whose shadow are the tombs of friars who came here from Spain to save Indian souls. We were accompanied by a purebred Zapotec Indian, a fine example of his race.

"We do not know the meaning of that trumpet call," he said. "We only know that it is very old. It came to us from our ancestors."

The trumpeter leaned over the battlements, the silver of his archaic bugle shining in the sun. It may have been—who knows?—carried in that first company of Spanish horse that invaded Oaxaca under Sandoval. In earlier times the men who sounded that call must have used horns of conch or reed. It was quite unlike anything one hears to-day—clear, mournful, barbaric—without a trace of European ancestry.

From the houses of the little village, men and women came to listen. When the strains died out they disappeared.

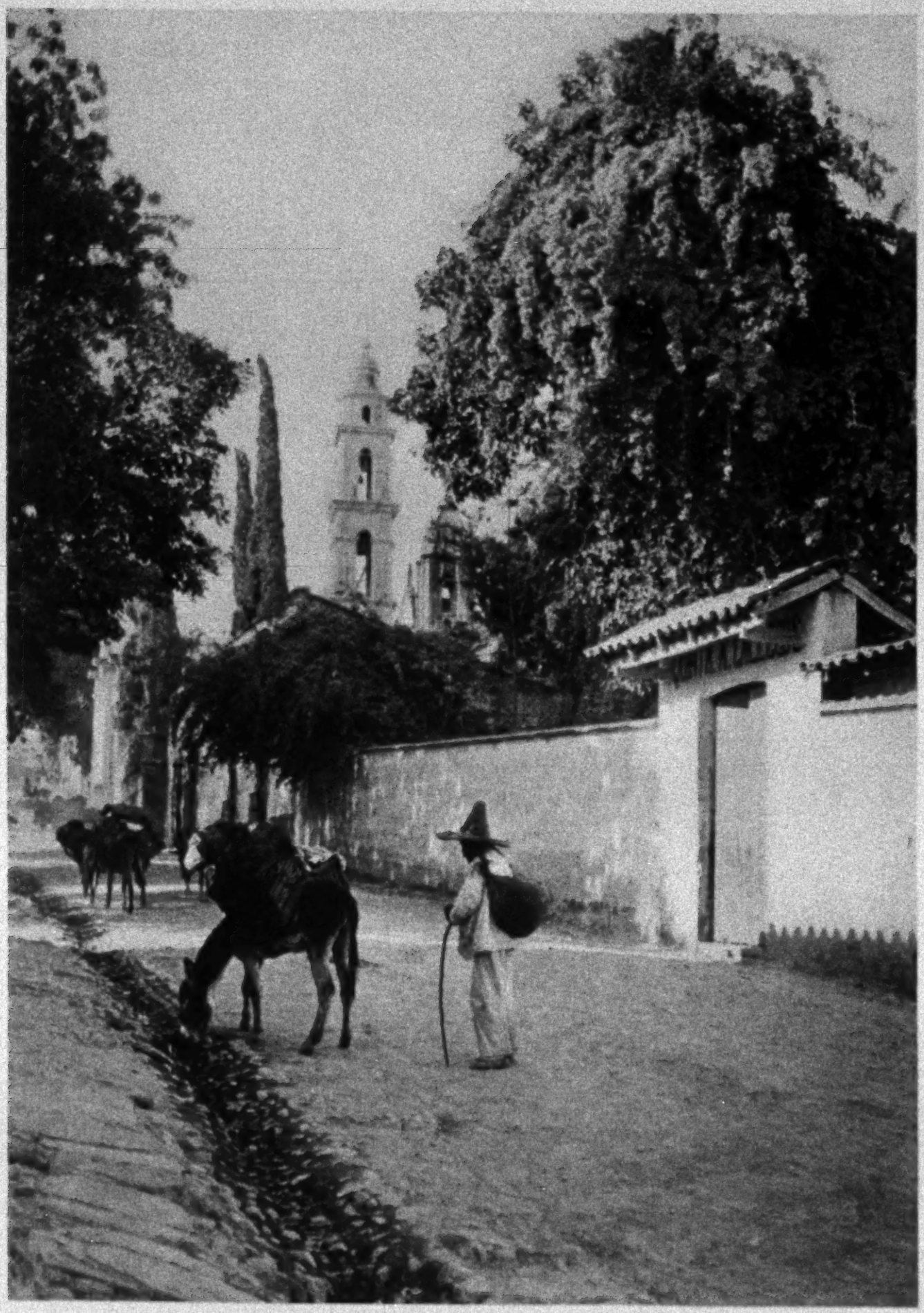
MITLA OF CHIEF INTEREST TO ARCHEOLOGISTS

Two hours away are the ruins of Mitla.* They are world-famed among archeologists, with their subterranean passages, their immensely thick walls, and their unread inscriptions.

But, after all, they lack interest for the uninitiated in archeology. A scientist might be absorbed in them, but any one else is apt to find them tame compared to the living Indians of to-day. I had rather see one such sight as that at an Indian village this same morning—the door of a jail made of barred timbers a foot square, with a dark face in each opening, and crouched upon the doorstep a faithful woman bringing food and drink to her man—than a score of Mitlas.

We tramped about through the ruins faithfully, for all that, though more because of our retinue of followers than

* See "Hewers of Stone," by Jeremiah Zimmerman, in the NATIONAL GEOGRAPHIC MAGAZINE for December, 1910.



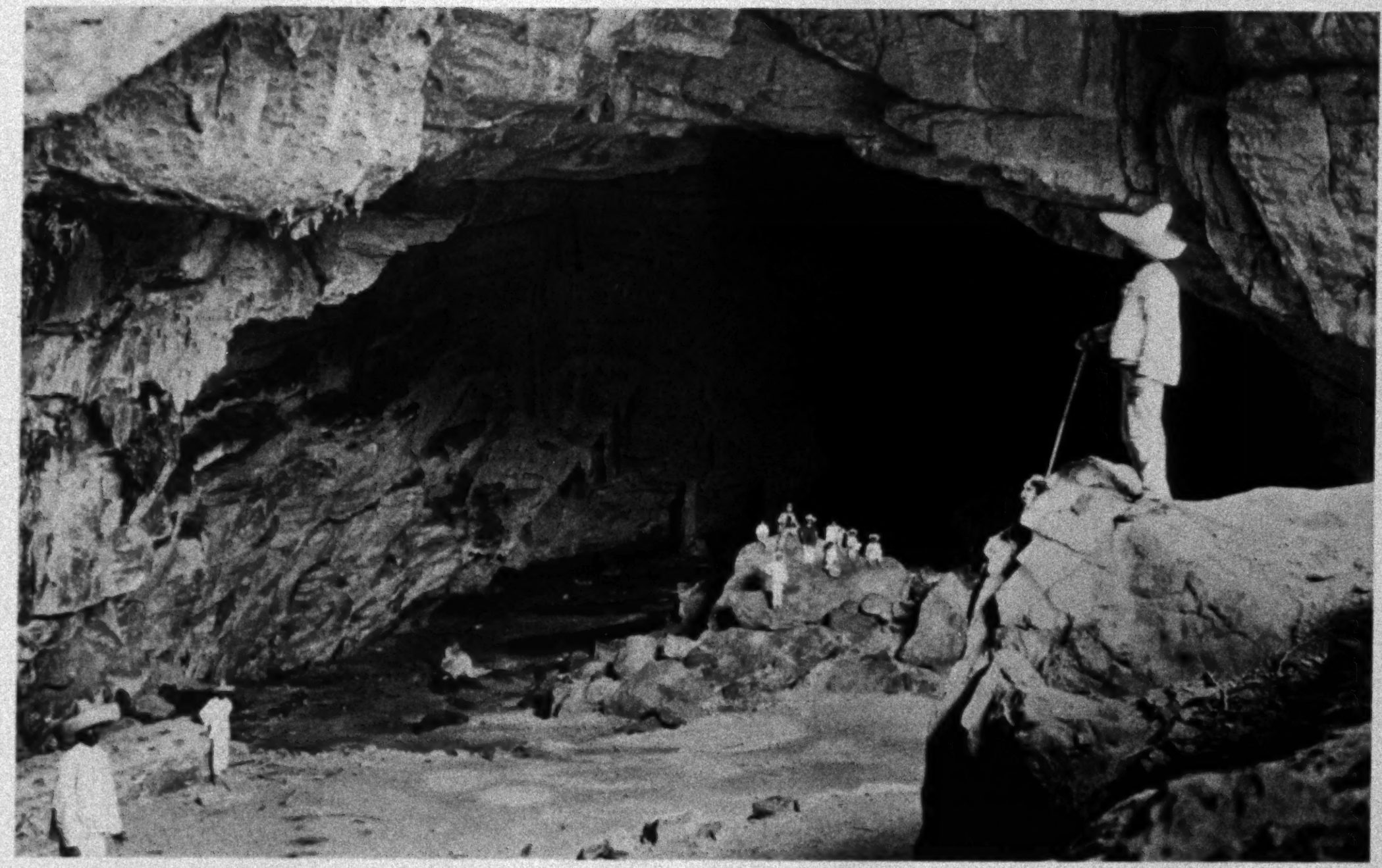
Photograph by Sumner W. Matteson

SPANISH TREASURE TRAINS ONCE TRAVELED THIS HIGHWAY: CUERNAVACA

The weary peon, returning from the Cuernavaca market to his home in the near-by pueblo of Tlaltenango, is apparently unconscious of the gorgeous panoply of color through which he moves—the mass of Bougainvillæa foliage in the center and right a deep-wine or purple, the green cedar spires, the red-tile roofs, enamel domes, and cream-tinted walls.

OVERLOOKING THE ZÓCALO, OR PLAZA MAYOR, OF MEXICO CITY, THE STAGE ON WHICH MUCH OF MEXICO'S TROUBLED HISTORY HAS BEEN ENACTED

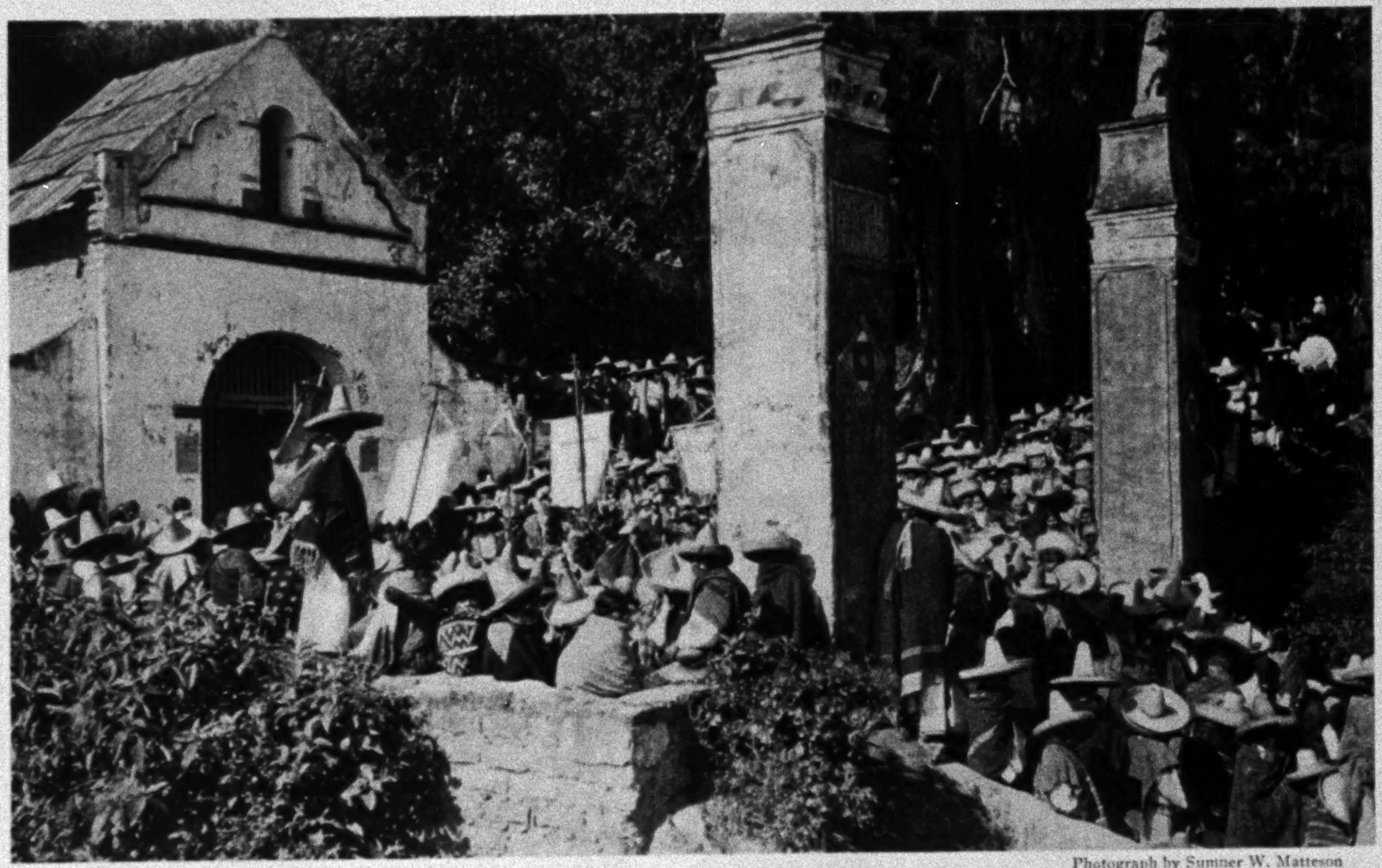
Liberators have been proclaimed here, and Christian churches built on the ruins of pagan temples. The beautiful trees which in former years adorned the plaza were destroyed by gunfire in revolutionary fighting. The view is through the arches of the Municipal Palace, looking toward the cathedral.



Photograph by Sumner W. Matteson

THE ENTRANCE TO MEXICO'S MAMMOTH CAVE, CACAHUAMILPA

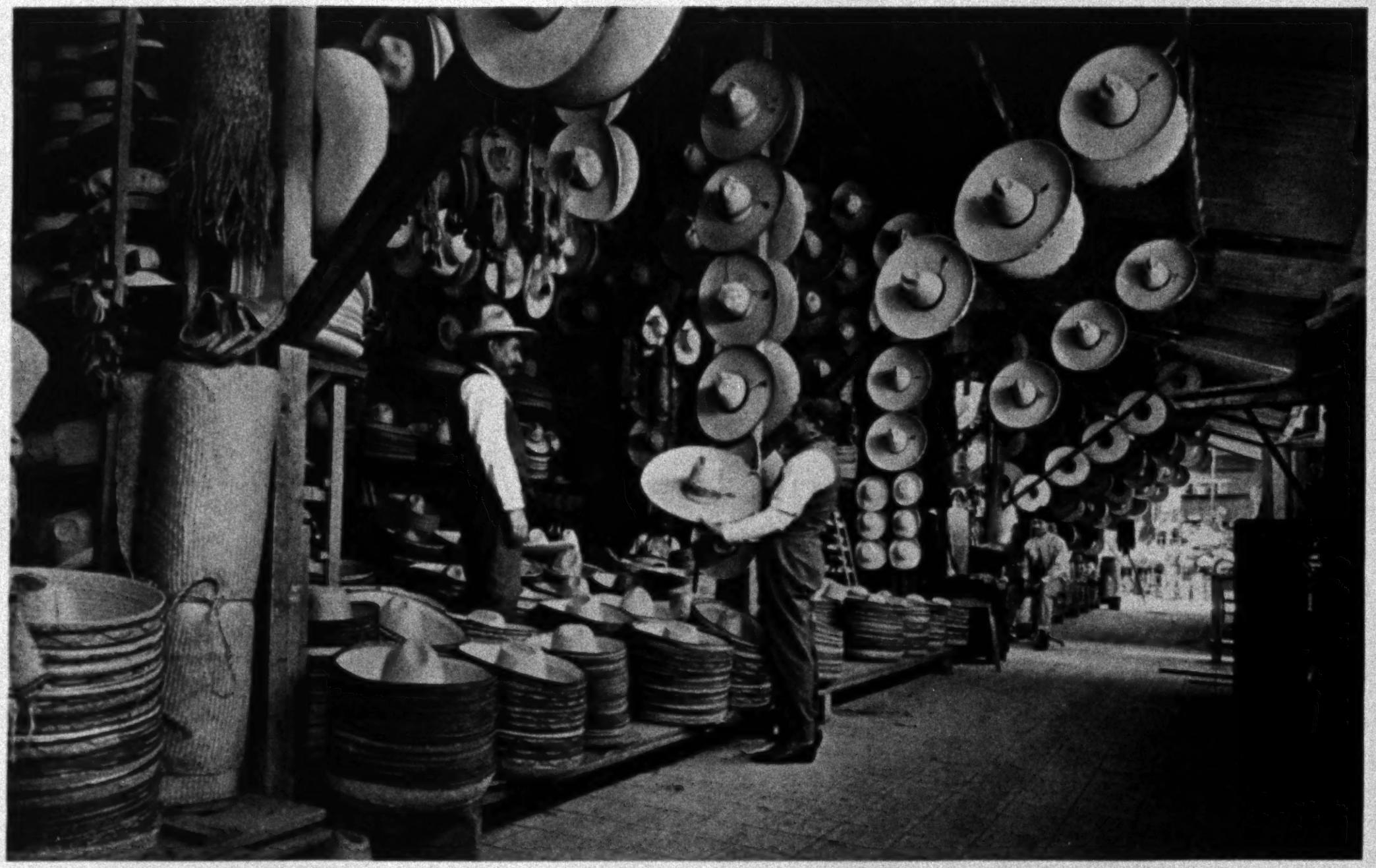
The portal is 70 feet high and 150 feet wide, and the rocks are so symmetrically disposed as to make the arch appear to be of artificial construction. The cave, situated 46 miles southwest of Cuernavaca, was discovered nearly 100 years ago. Upon one of the walls up to a few years ago the visitor could decipher two significant inscriptions: "Maria Carlota (Empress Carlota) reached this point," and "Sebastián Lerdo de Tejada (an opponent of monarchists and for a short time a president of Mexico) went beyond!"



Photograph by Sumner W. Matteson

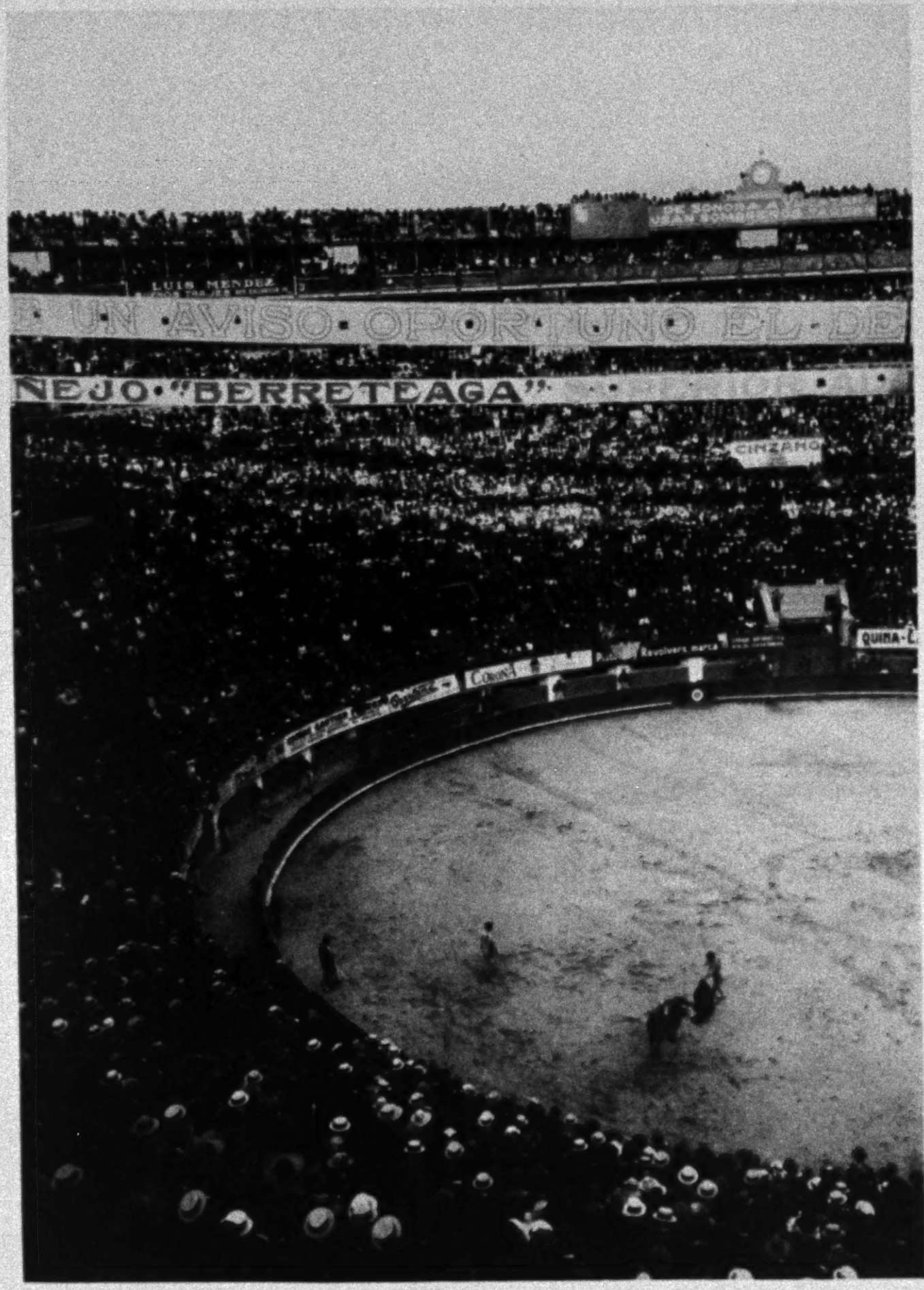
INDIAN PILGRIMS ASSEMBLING TO ASCEND MEXICO'S SACRED MOUNTAIN ON THEIR KNEES

On the summit of Sacred Mountain, which stands at the foot of Popocatepetl, is a cave in which dwelt one of the twelve apostles to the Indians who came to Mexico in 1524. For many years the shrine has been visited during Holy Week by devout thousands, some of whom ascend the hill on their knees.



HATS FOR EVERY HEAD IN THE STALLS OF THE MERCADO DEL VOLADOR, OR THIEVES' MARKET, OF MEXICO CITY

The Palace of Montezuma once stood on the site now occupied by the Volador, which gets its name from a favorite gymnastic game (volador) of the Aztecs. The Mexican takes great pride in his hat and wears the best he can afford. Some of the more ornate specimens weigh several pounds, depending upon the number of silver ornaments attached. Peons use the upturned brims of their cheap straw sombreros as carryalls for food and trinkets.



A TENSE MOMENT IN THE BULL RING AT MEXICO CITY

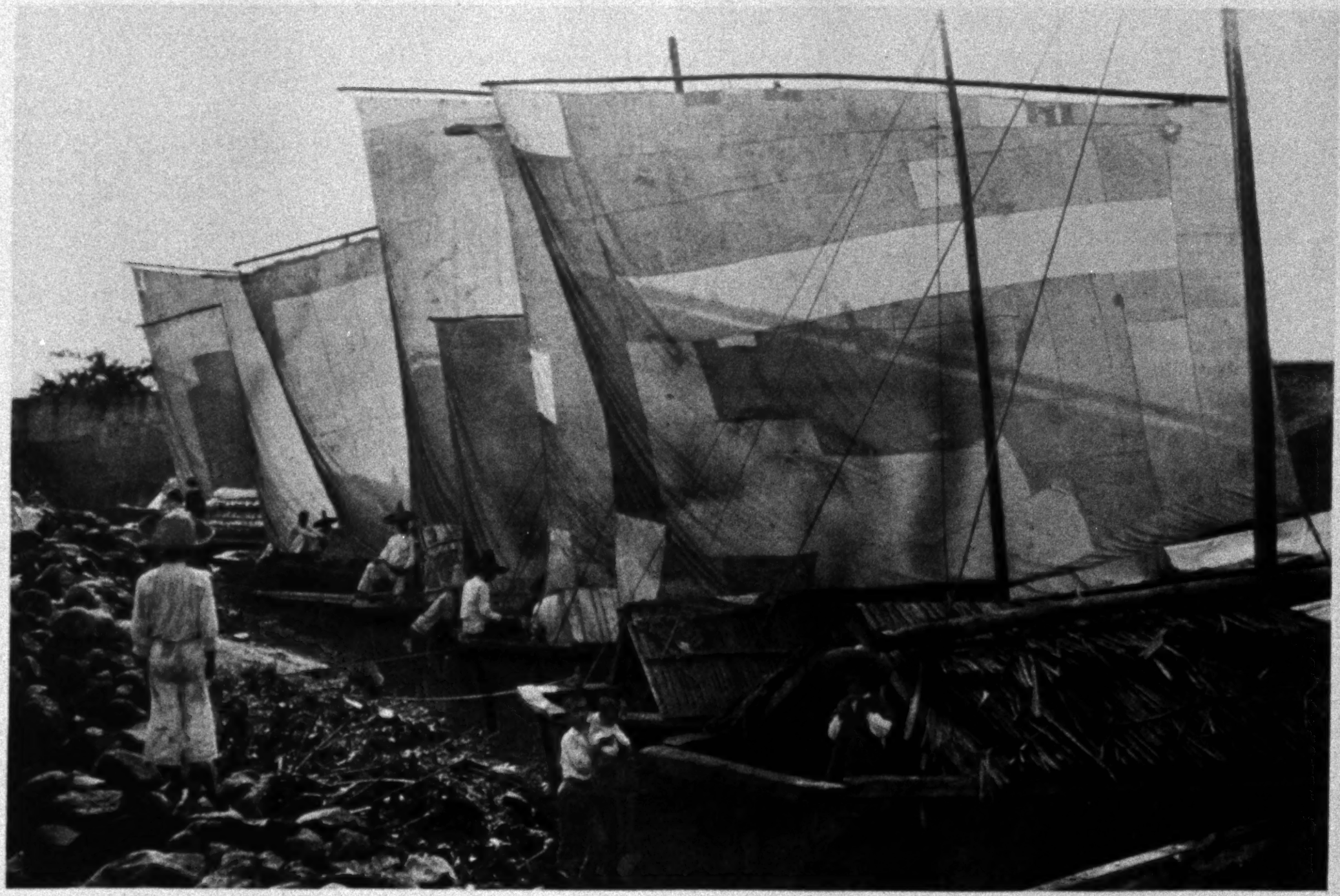
The favorite sport of Mexicans has for its arena an immense concrete and steel ring which on festive occasions holds 20 000 enthusiasts. Famous matadors from Spain and South America, as well as native experts, fight here.

SCORES OF HUMBLE MEXICAN VILLAGES HAVE ANCIENT CHURCHES OF RARE CHARM

During the 300 years from the Spanish Conquest to the establishment of a republican form of government more than 9,000 churches were built in Mexico (see text, page 501). This architectural witness to centuries of turmoil is hidden away in a Oaxaca hamlet.

A WATERFALL ADDS ITS BEAUTY TO THE GRANDEUR OF MEXICO'S "GIANT'S CAUSEWAY"

This basaltic formation occurs on the Hacienda de Regla, near the silver district of Pachuca. The immense columns are split by a gorge through which a torrent rushes into a wide basin surrounded by 150-foot cliffs.



Photograph by Sumner W. Matteson

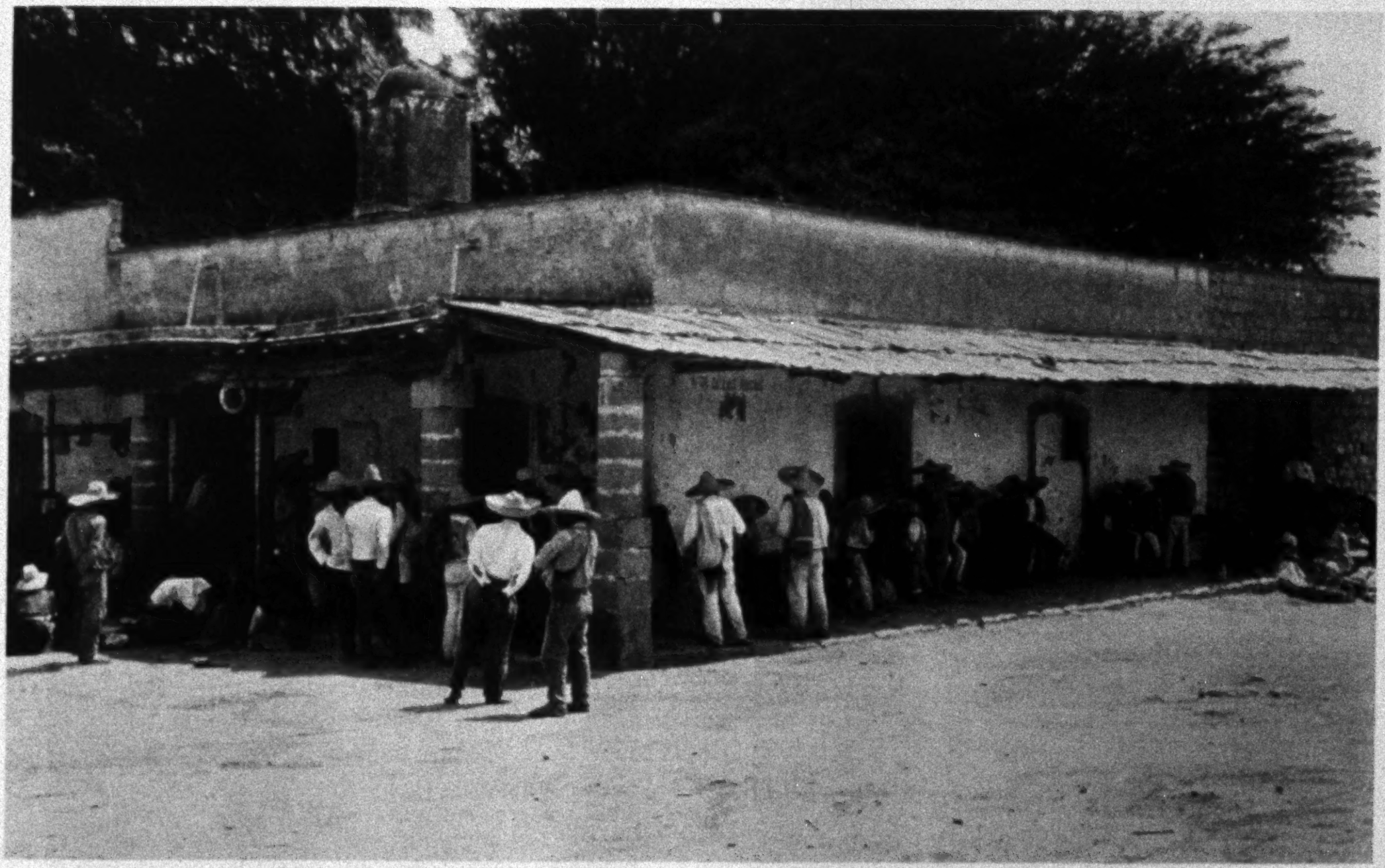
LAKE CHAPALA SAILBOATS DRYING OUT AFTER A RAINY NIGHT

This, the largest of Mexican lakes, in the State of Jalisco, is 70 miles long and 20 miles wide. Its climate is that of a perpetual Indian summer, which makes it a winter haven for northern wild fowl and attracts throngs of visitors to a popular resort on its shores known as the Mexican Riviera. The fishermen from the lake villages always stop at one of the churches to pray for a heavy catch and a safe return.

Photograph by Sumner W. Matteson

COLIMA VOLCANO, SEEN FROM EL NEVADO

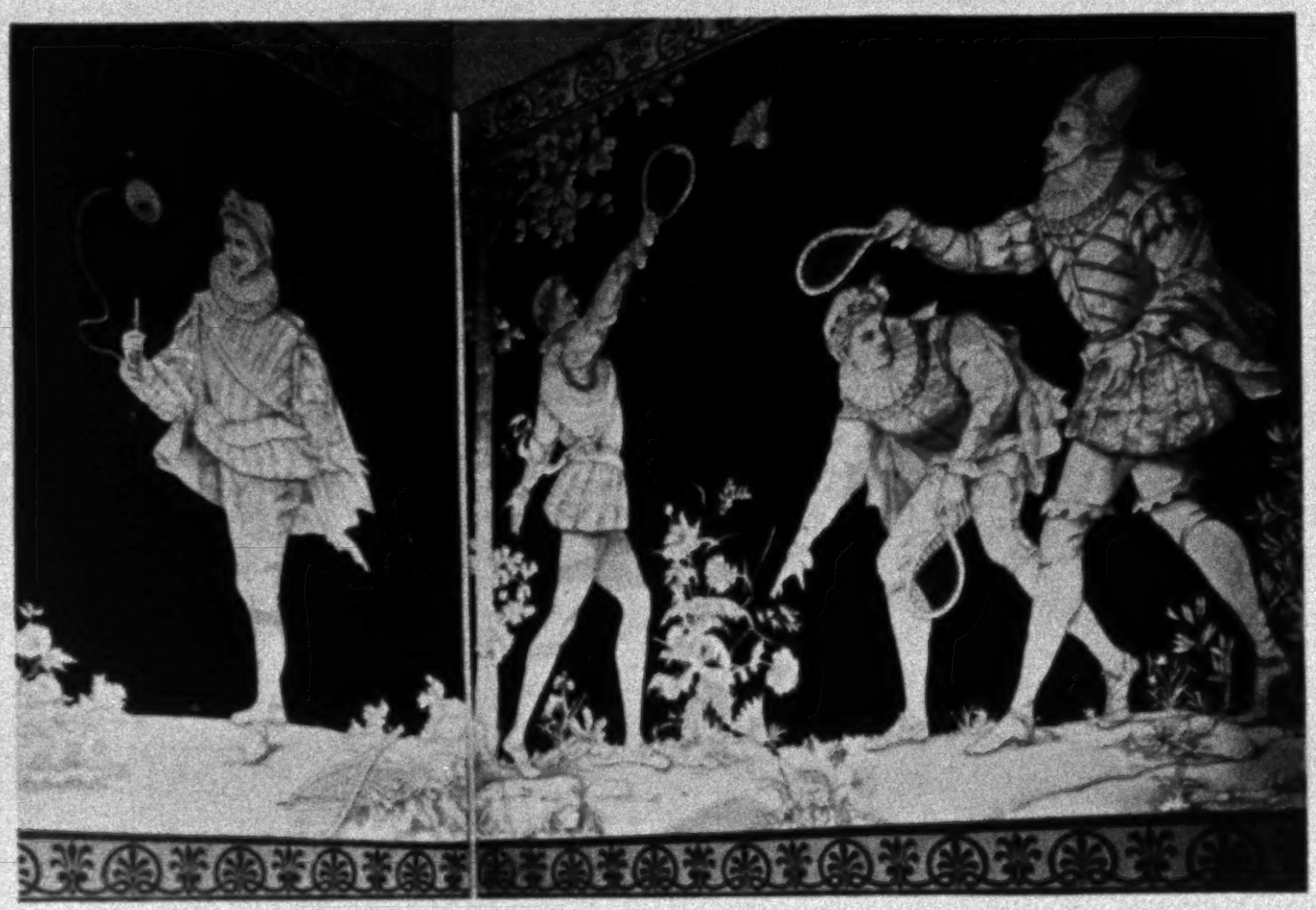
Colima's isolated, beautifully shaped cone, is often hidden by dense masses of steam and smoke, colored with flames at night. The peak is more than two miles in height, with an almost circular crater 1,600 feet in diameter. El Nevado (The Snowy One), a neighboring peak from whose slopes this photograph was made, is almost 1,000 feet higher than Colima.



© F. E. Fanger

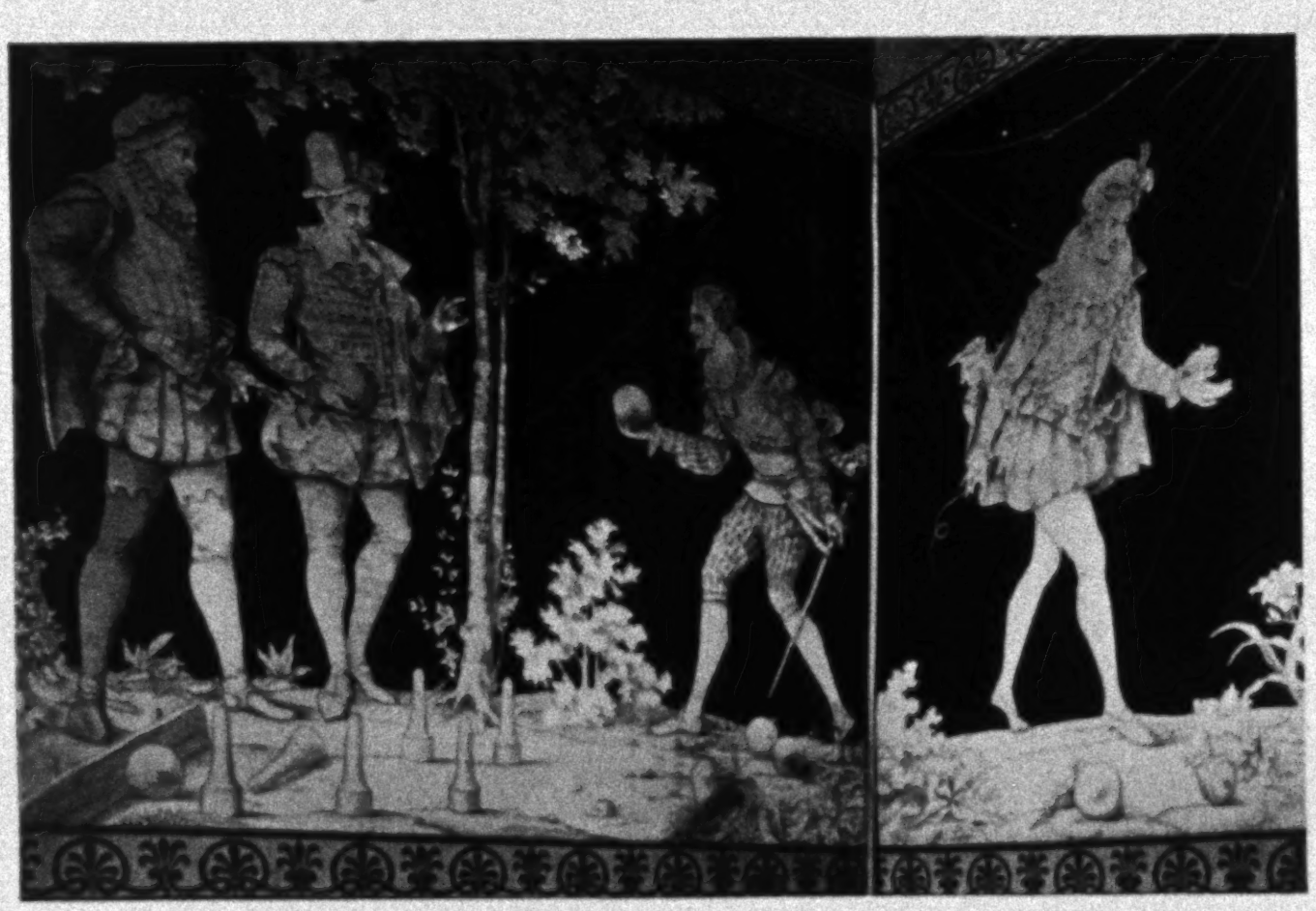
MEXICO'S "CRACKER BOX" FORUM

In the small villages the corner *tienda*, or grocery store, is the favorite meeting place for men and boys on Sundays and holidays. Here their small purchases are made and gossip exchanged. The white cotton suits, such as worn by several of these Indians, are fast disappearing on the tableland; coarse woolen clothes of native manufacture and imported overalls are taking their places.



MAXIMILIAN'S FURNISHINGS ADORN MEXICAN PALACE WALLS

These figures, made of white silk appliquéd on maroon satin, form the decorations for the smoking room in the Palace of Chapultepec (see below).

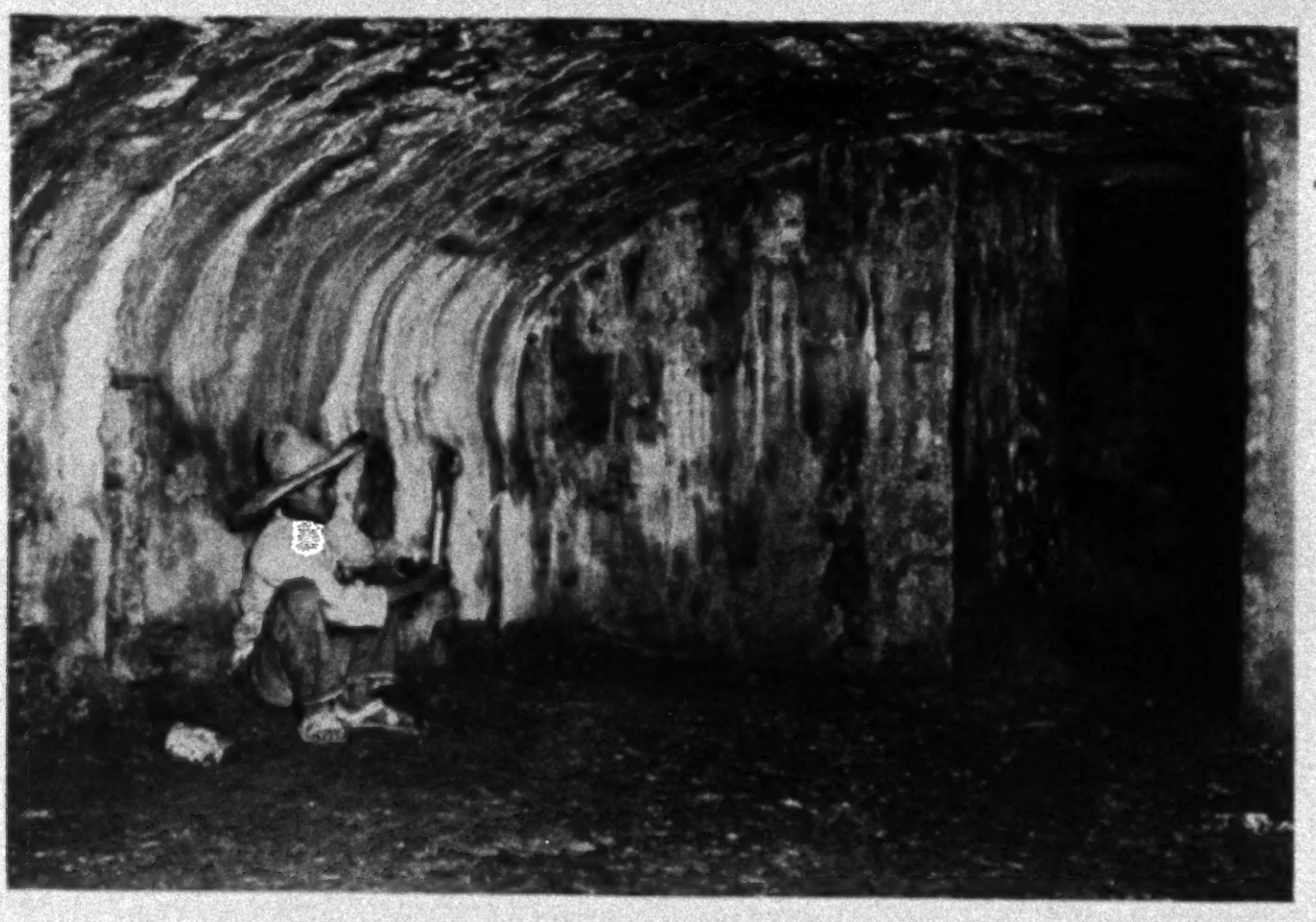


CHAPULTEPEC'S REMINDERS OF THE SECOND EMPIRE

The panels depict gentlemen of France, in the time of Henry III, playing at battledore and shuttlecock, spinning tops, and bowling. Chapultepec, which is in part the official summer home of the President of Mexico and in part the Republic's West Point, owes much of its present-day imposing appearance to the unhappy Emperor Maximilian.

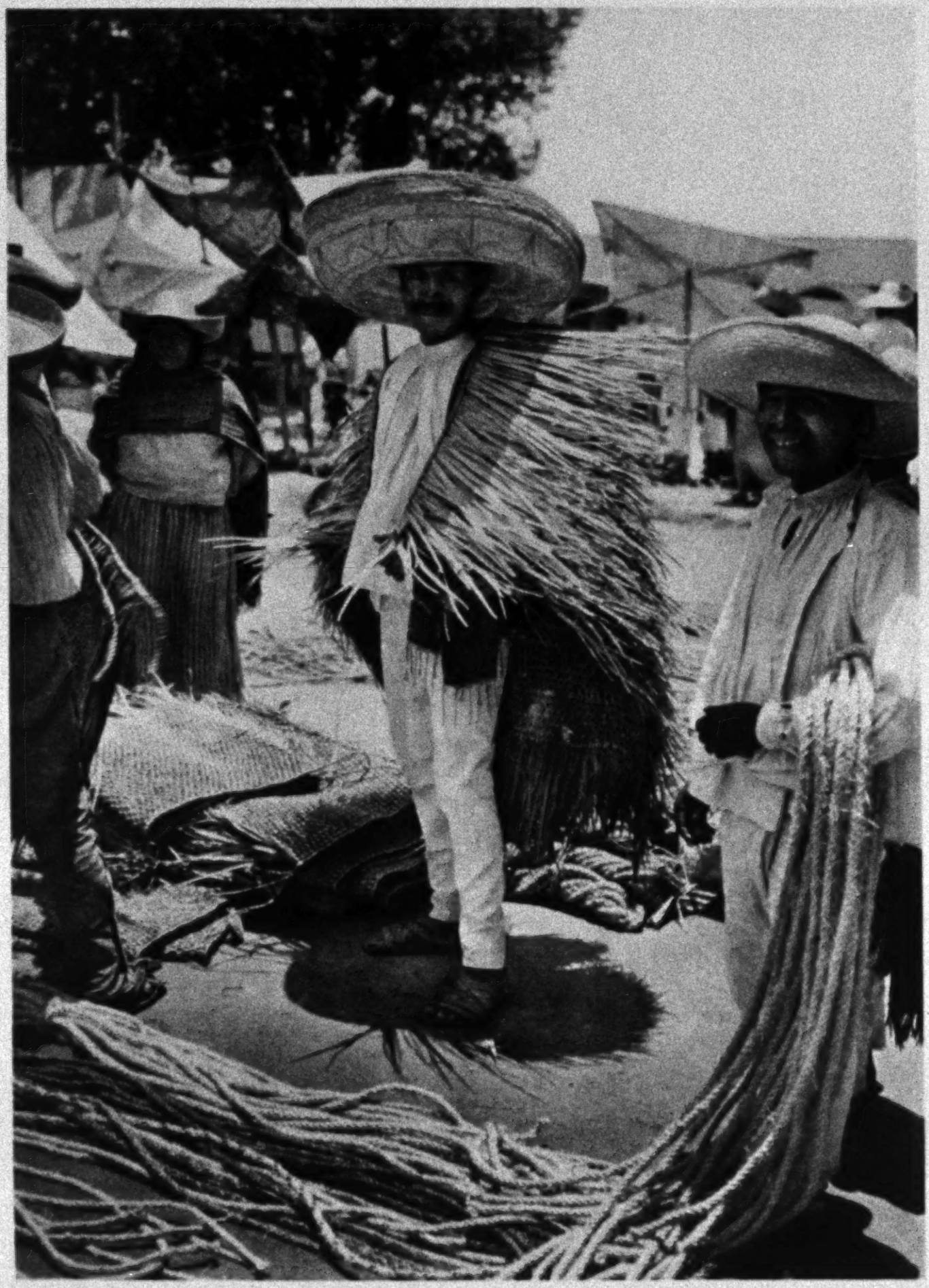
LILIES FROM THE FLOATING GARDENS OF XOCHIMILCO, NEAR MEXICO CITY

These large white blooms are favorites in the flower markets of the capital. The Indian women gather them in big baskets and bring them to the city in their canoes.



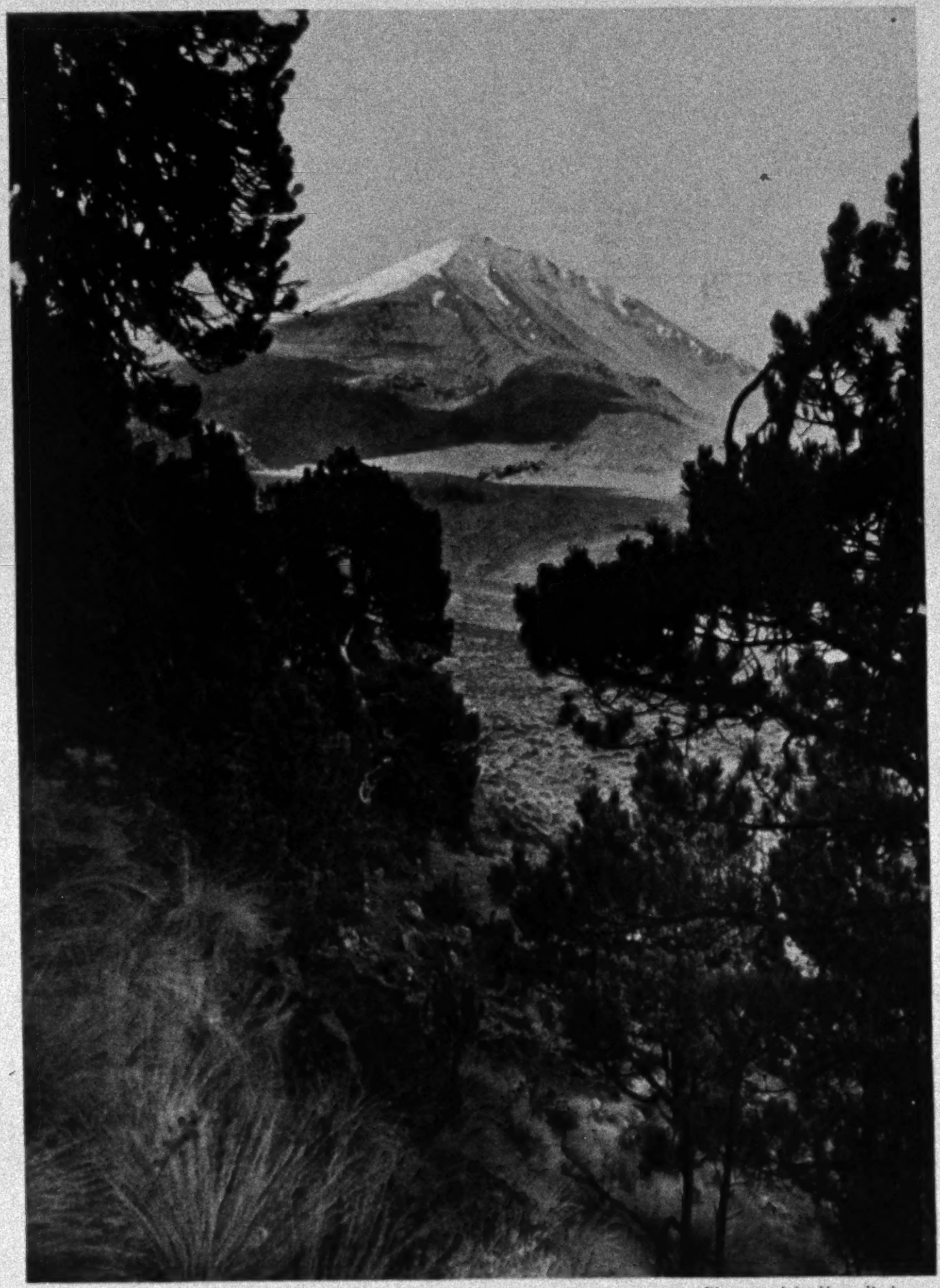
HE SITS WHERE RECALCITRANT MONKS ONCE PAID PENANCE

The sixteen disciplinary cells of El Desierto, built more than three centuries ago, ten miles outside the Mexican capital, could tell many a tale of sorrow if their walls had tongues to confirm the legendary stories concerning those who were supposed to have been chained to the floor and left in darkness to reflect upon the sins of the world.



A MASCULINE MANNEQUIN IN A MEXICAN MARKET

A native of Puebla State demonstrates the correct way to wear the large square mat of palm leaves woven to be used as a rain coat. His companion offers for sale a quantity of rope made of the same palm leaves.



Photograph by Hugo Brehme

THE MOUNTAIN MONARCH OF MEXICO

"Orizaba," says a wit, "has what mortals rarely possess united: a warm heart, with a clear, cold head!" Its 18 700 feet have been scaled more than once. To the Aztecs of to-day it stands in the same religious light as Fujiyama to the Japanese.

Photograph by Sumner W. Matteson

FROM A GLOOMY CAVERN RUSH THE ROARING WATERS WHICH FORM MEXICO'S MAGNIFICENT TZARÁRACUA FALLS

The thundering torrent plunges 90 feet into a swirling pool. Though the volume of the main fall is huge, its chief beauty lies in the neighboring miniature falls which flow from tiny fissures in the rock, sprinkling waving ferns and flowers with sparkling jets. The waterfalls are six miles from Uruapan, a town of 15,000 inhabitants, in the State of Michoacán.

because of our interest in a stone story that no one can read to-day. They haunted us with offerings of little godheads in clay, and copper axheads found in the tombs, and bits of stone carvings. The axes were of such unusual hardness and density that some believe the ancient Zapotecs possessed the secret of tempering copper.

THE WEAVERS LEFT THEIR LOOMS

The natives of Teotitlán had been warned of our coming, and as we entered the plaza the weavers gathered from their huts, each with a burden of gaudy blankets on his shoulder.

The Indian who wove them, on a hand loom that is common to every primitive people, in the cool shadow of the portico of his little hut, by the side of which, under the peach trees, a little stream tinkled in a stone-lined ditch, obviously knew himself to be in the wrong when he asked eighteen pesos for them. Later it seemed to me that he displayed an unseemly haste in closing at my offer of ten pesos each.

After all, he said that he could finish a serape in a week, or maybe in two weeks if he did not work too hard.

The sturdy mountaineers of San Pablo Guelatao, in which little village Benito Juárez was born in 1806, were to hold the annual fiesta in honor of his birth. They have a flaming pride in the fact that the First Reformer was born in their hills, as well they might have. Not a drop of other blood than Zapotec ran through Juárez's veins, and until he was twelve years old he did not know a syllable of any other language than that of his tribe. Then he became an errand boy in the shop of a bookbinder in Oaxaca City.

Throughout his life Juárez fought for a free Mexico. He was hunted, imprisoned, threatened with execution, and finally exiled, to become a fruit peddler on the streets of New Orleans. Before he died he ordered the execution of Maximilian, although the President of the United States and the sovereigns of France, Great Britain, and Austria pleaded with him for mercy. The memory of no other man is so reverenced in Mexico to-day.

The horses were at the door at 4 o'clock in the morning for the trip to Guelatao. Others joined us. One was a deputy of the Oaxacan legislature — a brown, strongly built Zapotec, on a buckskin horse that bucked in sheer exuberance.

It was a forty-mile hammer into the Zapotecan highlands. Wherever the road was moderately level, we loped or trotted our horses. We passed ruined houses, some of which had been destroyed in the past ten years; others dated back to Spanish colonial times. There were arched brick bridges over the ravines and a brick aqueduct, built by the Spaniards, which still carried a stream to irrigate neglected orchards.

Barefooted, blackened charcoal burners hailed us, as they climbed the heavily wooded hills toward their kilns. Time after time they took short cuts, bounding up precipitous hillsides like deer, to meet us at the angles of our switchbacks.

Goats took the place of the pig of the lower levels. Goats feed themselves, whereas pigs must be provendered, and in the mountains there is no corn to spare. At some of the wattled huts hens were hanging head downward to cure them of their passion for motherhood.

We began to meet men with rifles and others carrying deer and goatskins to market for the few pennies they would bring. In the hills back from the trail Indians communicated unseen by whistling and clear, buglelike calls. From one high ridge we looked down into a valley, perhaps five miles away and half a mile beneath us, although its details stood out as sharp-cut as those of an etching, in this brilliant mountain air.

"As old as Mitla," said the deputy. "Almost as old, at least. Our people have lived there for generation upon generation."

NO WHEELED VEHICLE EVER SEEN HERE

At last we came to Guelatao, as twilight deepened into dark. A mud-walled village, flat-roofed, set in pleasant orchards and little fields, checkerboarded by stone walls, in which no wheeled vehicle has ever been seen. The sound of running water came from every crevice in the hills, and a rivulet washed down between the thigh-high stones of the single street.

"To-morrow," said my escorts, "we celebrate the birth of Juárez here, where he was born. To-night we go on to Ixtlán, because there is no place in Guelatao where you can sleep."

LOOKING DOWN UPON THE BIRTHPLACE OF BENITO JUÁREZ

In the small Indian pueblo of San Pablo Guelatao, "mud-walled, flat-roofed, set in pleasant orchards and little fields," Juárez, one of Mexico's greatest men, was born in March, 1806 (see, also, text, page 549). His Indian townsmen have a flaming pride, not only that he was born in their hills, but also that he was a pure-blooded Zapotec. His memory is venerated in Mexico as is that of no other man.

GUELATAO CELEBRATES THE BIRTHDAY OF JUÁREZ, FIRST IN THE HEARTS OF MEXICANS

"A band of seven pieces marched ahead, and the little boys of the town followed, stumbling over the great rocks of the street" (see text, page 551). The procession includes not only the band, but the entire population of near-by Ixtlán.

NOTABLES OF THE STATE AND CITY OF OAXACA GATHERED AROUND THE MONUMENT IN THE BIRTHPLACE OF BENITO JUÁREZ ON THE ANNIVERSARY OF THE PATRIOT'S BIRTH

At Ixtlán a real welcome awaited us. The judge came to escort us to the Municipal Palace, together with the mayor of the town. The former, being of a conservative, legal mind, carried an old-fashioned wooden-handled sixshooter, but the latter, as became the head of a City Booster's Association, had a gun ornamented in ivory and silver.

A FEAST OF FRIENDSHIP

There was a charming little plaza, with a bubbling fountain in the center, from which girls carried water in great brown pots, set upon their shoulders or on their heads, and into which one looked from the tiny porticoes that edged the Municipal Palace.

It was but one story deep and high, this palace, and had been burned by revolucionistas when they captured Ixtlán, some years ago.

"We have just rebuilt it," said the judge. "We are very proud."

They might well be proud. Their little fields and flocks keep them alive and no more, in these mountains. The mines, which once gave employment, have been closed. The fact that they were able to rebuild at all, and that they were willing to open their scanty purses for such a purpose, is proof of the quality of the Zapotecs.

They had prepared a little feast for me that night. "Just to show our friendship for the United States," they said.

Never did I enjoy a feast more than that served at Ixtlán. One guessed that the resources of the place had been strained to provide it. In these villages there is no restaurant or hotel, for the only travelers who come bring their own food and sleep in the plaza, in their own blankets.

There were eggs, served in bowls, and tortillas and bread and chocolate—no more. But the little dinner was memorable because of the spirit of the diners.

"We have little," they said, "but that little is our own. We are free men."

The sun had hardly risen next morning when we began the march down the hill to Guelatao, headed by the dozen soldiers of the garrison. A band of seven pieces marched ahead, and the little boys of the town followed, stumbling over the great rocks of the street, but bravely carrying aloft flags made of colored paper pasted in strips. The local dignitaries had managed to find sashes.

The schoolmaster, with his youngster aloft on his shoulder—a dapper, kindly, quick-spoken little man, with tiny hands and feet and a mass of black hair rising in a very fountain of curls—confided in his exotic English that his father had been an American and his mother French, and that he had been born in this village of Ixtlán. One wondered, vainly, what that romance could have been.

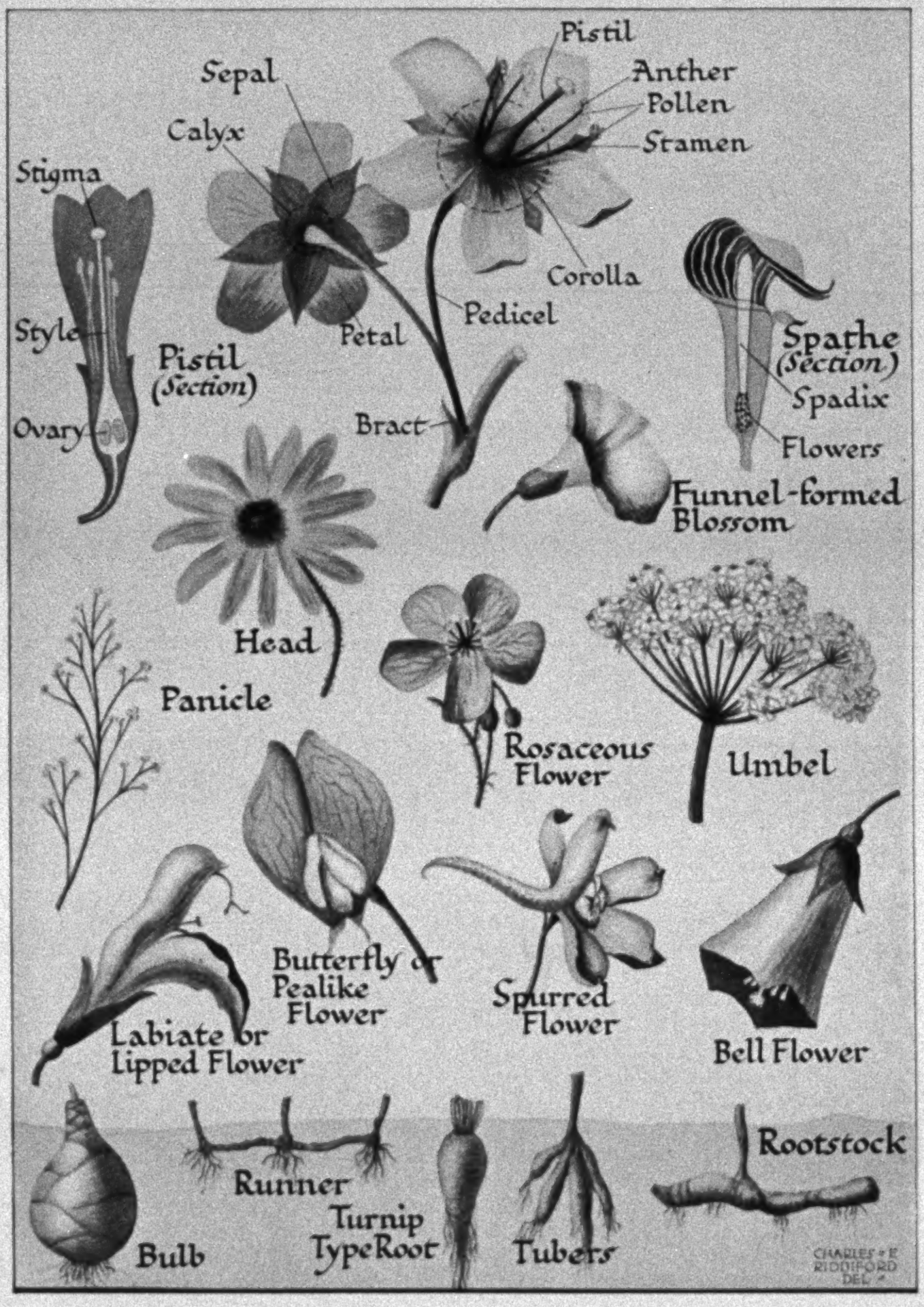
After flowers had been heaped at the foot of the little monument to the First Reformer, set in the tiny park which looks upon the site of the mud-walled, straw-roofed hut in which he was born, and the local great men had had their prolonged say, it was the children's turn to declaim.

ZAPOTECS ARE FIGHTING FOR KNOWLEDGE

Then came the great event of the day. Revolucionistas had burned the school some years before, but by day's work—without money to spend, without help—this Indian community had rebuilt it. There had even been a new table made for the schoolmaster, who serves almost without pay, for in Mexico the teacher takes his reward in fair words and few and intermittent pesos.

The little ones of the school—round-faced, grave, puzzled little Indians—sat on their bench at the end of the room while the children from the visiting schools filed in and presented them with flowers.

It was a touching, a charming little ceremony, but it was also significant. Other tribes may be content to live in illiteracy, but the Zapotecs are fighting for knowledge. They remember the prophecy that in this tribe will some day be found the savior of Mexico.



TYPES AND PARTS OF FLOWERS

Whatever form the orthodox flower takes, it is an assemblage of four parts—stamens, which produce the fertilizing pollen, tipped by anthers; pistils, which receive the pollen in the stigma and conduct it into the ovaries, where it fertilizes the seed produced there; petals, that form the corolla, which acts as an advertisement to be read by the pollen bearers; and sepals, which form the calyx, whose main task is to shield the delicate machinery. It has been by the modification of these four parts of the flower, whether by the change in the numbers of stamens, pistils, petals, and sepals, by changes in their respective shapes, or even in their respective tasks, that the thousand and one familiar forms of flowers have come to us.

THE FAMILY TREE OF THE FLOWERS

By Frederic E. Clements and William Joseph Showalter

AS ONE walks through garden, field, and forest and notes there the thousand and one forms of flowers—the roses, peas, arrowheads, and lilies; the mallows, mustards, geraniums, pinks, and sumacs; the rushes, irises, myrtles, fireweeds, cacti, parsleys, and saxifrages; the heaths, primroses, gentians, phloxes, bluebells, honeysuckles, maples, and buckwheats; the sedges and orchids; the snapdragons and mints; the grasses and asters; wheat and ragweeds, walnuts and goosefoots; and all their kith and kin—one wonders at the statement of the botanist that they all spring from one original flower, and that the Eve of this magnificently diverse race is the humble, simple, little buttercup (Color Plate I).

And yet, in their aspiration to fit themselves for diverse rôles in life and for existence in new environments, in their resolution to adjust themselves to the intensifying competitions in their world, they have assumed all of the vast variety of color, form, and quality known to the flower lover.

ALL FLOWERS ARE SISTERS "UNDER THE SKIN"

Nor in doing so have they failed to write into their own beings, in characters which those who will take the pains to do so can read, the story of it all—a story which proclaims that whatever their differences of structure, of form, of color, of habit, and habitat—they are, like Judy O'Grady and the Colonel's lady, sisters under the skin.

In the garden varieties of roses, tulips, petunias, verbenas, and a host of other flowers this kinship is easily noted and readily traced. It is less obvious with different species of lilies, like the Turks-cap and the Bermuda; it must be diligently sought in the differences between tulips, hyacinths, trilliums, onions, and Solomonseals, and proves highly elusive at first when sought among the buttercups, anemones, marsh marigolds, clematis, peonies, columbines, and larkspurs.

Environment works wonders on the fair faces, delicate tissues, and individual forms of plant species. Waterlily, pondlily, and the fabled lotus of the Nile bear the mark of water in stem and floating leaf, and of a simple, tranquil mode of life in their many-petaled flowers.

Many of their cousins show the fashioning force of light, heat, and drought in root, stem, and leaf; the molding of bee or butterfly, the pull of gravity, and the breath of the south wind, in their flowers; and the effect of conveyance in their fruits.

Our present interest in tracing the family tree of the flowers is with the blossoms themselves. As one of the four organs of the plant the blossom has its own special work to do, and this, in turn, it apportions among its own four parts—its stamens, pistils, corolla, and calyx (see preceding page). In a sense it makes a general contract with the plant to make and deliver a certain number of good seeds, and sublets the four phases of the task to its several parts.

Of course, seed-making is impossible without pollen, and the task of the stamens is to deliver that. Nor can seed manufacture go on without the bodies that become seeds when fertilized by the pollen, and it is the job of the pistils to produce them.

But both stamen and pistil are rooted where they grow, and without pollen-bearing messengers their work would be useless. It becomes, therefore, the job of the corolla to make itself into a delightfully designed, brightly colored poster, which announces the flower's full line of nectar and pollen to the busy bee and butterfly world.

The fourth member of the blossom's household is the calyx. Its main task is to stand guard over the delicate machinery within the bud, protecting it from the drying effect of weather and relieving the tedium of this task with incidental manufacture of starch.

WHICH WERE THE FIRST FLOWERS?

When one asks which were the first flowers and hence the oldest, the answer is, those that are least skillful in securing

the transfer of pollen and in the making of seeds, for in the world of flowers, as in the field of human industry, efficiency wins and archaic methods mark no progress.

A large number of stamens means a high charge for transport in terms of pollen eaten or wasted, and a larger number of pistils means that many of them will fail of pollination.

By these tests of flower economy we find that the buttercup order, including buttercups, anemones, larkspurs, magnolias, and calycanthus, are the primitives of the floral world, and the snapdragons, lobelias, and orchids the most highly specialized. Among wind-pollinated flowers the most specialized are the latest arrivals on the field.

COUNTLESS GENERATIONS MARKED THE CLIMB OF BUTTERCUPS TO LILYHOOD

For a long time the buttercups must have remained uncertain as to the best plan for their blossoms. The calyx and corolla were the first to know their own mind and to settle upon their make-up. We see the vast majority of their descendant species fixing on five, four, or three sepals for the calyx, and the same numbers of petals for their corollas.

Progress was slower in the reduction of the number of stamens and pistils, and all of the members of the buttercup order, except a few highly specialized ones, have large numbers of both. For instance, the mousetail still produces hundreds of pistils, with the result that many of its seeds never ripen.

Presently the buttercups began to find their nectar diluted by rain and stolen by worthless marauders. A scale was provided as a roof for the nectar well, and later the petal itself became transformed into a nectar sack, as we may see in the columbines, larkspurs, and monkshoods.

Many flowers that made no bid for bee and butterfly patronage abolished nectaries and petals entirely. The wind could not be lured by color or sweets. But by hanging their anthers on long threads and making their stigmas plumelike, the pollen would be lifted away from the maturing anther by the wind and caught in the plumed stigma as it was carried by. So the meadowrue, clematis, and their ilk came to divide their labors between two sets of flowers, one set having stamens and the other pistils.

Though the conversion of buttercups into lilies must have taken innumerable generations marked by imperceptible changes, the actual number of steps by which this was wrought were not many. Indeed, the most striking characteristic of the flower of the lily even to-day is seen in some of the buttercups, the plan of three petals, sepals, etc.

The flowers of the arrowheads and waterplantains show no important differences from those of the buttercups, and, indeed, may be said to be buttercups that have become waders and lake dwellers, with a resulting change in their leaves and stems.

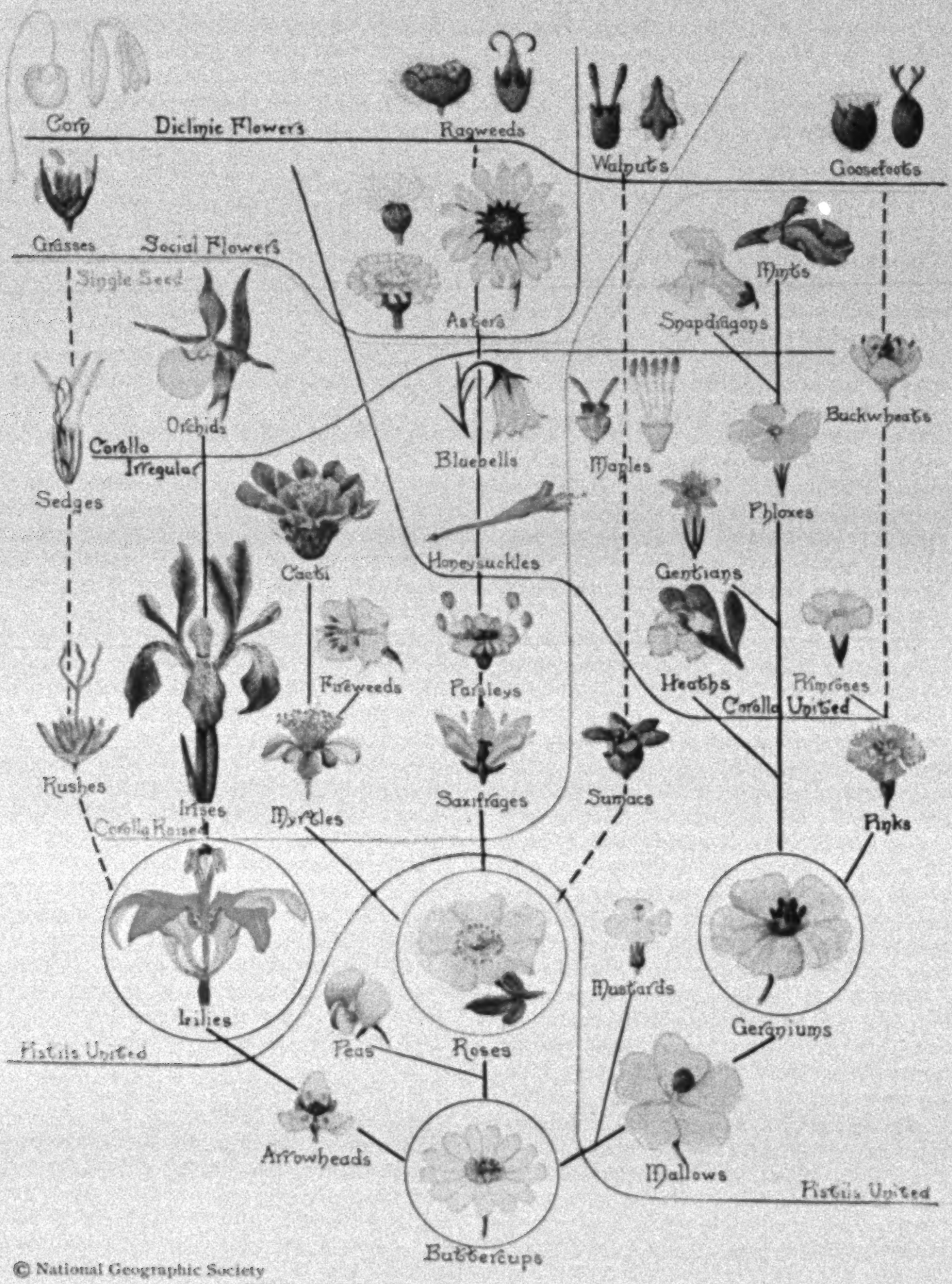
Some of their descendants, growing tired of the placid, uneventful life of the water, ventured forth upon the land again. Those that had lost the corolla requisitioned a leaf, painted it in bright colors, and wrapped it around the naked flower for protection and attraction, and presto! we have the calla "lilies," Jack-in-the-pulpits, and anthuriums.

Others enlarged the corolla, united the pistils, and presently became dayflowers and spiderworts, with a green calyx, blue or purple corolla, six stamens, and three pistils in one. It was no great step from these to the trilliums or wakerobins, the simplest members of the lily family.

The true lilies developed their beauty in answer to an evident need for greater publicity for their wares among the insect hosts. This they secured by coloring the green calyx like the corolla, so that the latter appears to have six petals instead of three (see Color Plates XXIX, XXX, and XXXI).

This "invention" proved so successful that all the insect-pollinated descendants, such as the snowdrops, daffodils, irises, and orchids exhibit it. Its effects are likewise observable in the wind-pollinated rushes, sedges, and grasses.

Once the lilies gained this development they were so well satisfied with their flowers that they became conservatives, little given to radical changes. They made many departures in color, shape, and size, but in the fundamental organization of the blossom they have adhered so closely



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THE FAMILY TREE OF THE FLOWERS

All of our flowers, according to many botanists, are descended from the buttercup. Those which have stayed strictly at home are buttercups still, but those which sought to adjust themselves to new environments became arrowheads and lilies, roses and peas, mustards and mallows, as the family tree suggests. The peas and mustards have not adventured further in family ramifications, but the geraniums, roses, and lilies have vastly enriched the variety and beauty of the floral world by their contributions. The solid lines indicating descent show those flowers on the family tree which are fertilized by insect-borne pollen, and the broken lines those which are fertilized by wind-borne pollen.

to their traditions that whether they be tulips, mariposas, onions, hyacinths, aloes, asparagus, lilies-of-the-valley, or yuccas, they still wear the common coat of arms of the family.

LILIES ENAMORED OF THE WINDS BECAME PALMS AND GRASSES

Those lilies which seemed to lose out in the race for insect favor began to fit themselves for wind pollination, in the course of which they become rushes, palms, sedges, and grasses. One line of descent produces the palms, which are little more than arborescent lilies henceforth freed from the necessity of renewing their bodies every year.

Progress has been slow in the palms, and in the majority the flower is still essentially that of treelike lilies, the dracenas, or palm lilies. In the highly specialized palms the stamens and pistils have been separated, the latter becoming reduced to a single cell.

The rushes, in their turn, are little more than grasslike lilies. Their flowers would be almost indistinguishable from those of such lilies as the asparagus were it not for the telltale evidence of filament-borne anthers and wind-catering stigmas, which show that they have ceased to appeal to the insects for pollination. The sepals and petals become dry and rigid, because attraction counts for nothing with the wind. Both dwindle at the same rate and become merely bristles in the sedges. The materials saved as a consequence are available for longer filaments and stigmas.

In the case of the sedges this conversion of the protective parts appears to have been overdone, for the sedge flower has called to its aid one of the tiny upper leaves to enclose the stamens and pistil.

As the sedges are the descendants of the rushes, the grasses are sprung from the sedges. Their stamens and pistils are still better adapted to wind pollination. Two scales are employed to protect the flower and two others to shield the flower cluster.

GRASSES ARE MAN'S MOST VALUABLE PLANTS

The effectiveness of all these changes is to be measured in the immense success that the grasses and grains have achieved in Nature as well as under cultivation, and is attested by the fact that man depends upon them for his food supply, direct and indirect, more than upon all other plants combined.

Turning back to the lily again and following its insect-pollinated line, one notes that what changes have been wrought are few and gradual—few and of such a slight nature, indeed, that even the novice finds the evidences of close consanguinity in the amaryllis, snowdrop, daffodil, and tuberose.

The most marked improvement is that of placing the corollalike perianth on top of the ovary, where it will be the more readily seen by the questing bees. So decisively good did this departure prove that all descendants of those lilies which adopted this have preserved it, including the irises, cannas, bananas, and orchids.

The iris, with its kith and kin, the crocuses, the gladioli, etc., is little more than an amaryllis; increasing efficiency in pollination has enabled these to dispense with one row of three stamens.

A tendency to irregularity crops out in this group, attaining its highest expression in the orchids. Here the lower petal becomes enlarged to make a huge lip, or sack, as in the ladyslipper, with the usual consequence of reducing the number of stamens.

Through some curious oversight the orchids forgot to reduce the pistil to a single cell, but maintained the ancestral number of three, with the result that a single pod will often bear a million seeds. These, however, are so minute and contain such a little store of food that they have practically lost the power of germinating.

FOLLOWING THE ROSES THROUGH THE AGES

Let us now go back to the buttercups and follow the rose branch of the family down through the ages. If we take the most primitive roses and put them by the side of the buttercups, we discover how short the first step of descent actually was. The flowers of the strawberry and the raspberry might easily pass for buttercups. The chief difference consists in the tendency of the calyx to form a cup which bears the stamens and petals on the edge. This not only puts the petals in a better

position for attraction, but contributes to the formation of the fruit.

While roses undergo more or less reduction in the number of stamens and pistils, their flowers are much alike, though their fruits have taken scores of forms, ranging from the tiny seedlike ones of the cinquefoil to rosehip, raspberry, and blackberry, and from apple, plum, pear, apricot, and almond to the burrlike fruits of the avens and the agrimony.

We see the meadowsweets departing from the rose household, later to found families of their own. They reduce their pistils to five, more or less sunken in a cup that bears the sepals on its margin, and the petals and stamens on these. The red haw, apple, and pear have sprung from the meadowsweets, as have the almonds, peaches, cherries, and plums.

Likewise, the syringas offer evidence of their descent from the meadowsweets. They make a distinct contribution to family history and progress by uniting all their pistils into a compound one, with a corresponding elevation of the corolla which, together with the numerous stamens, furnishes the badge by which this line of rose descent finally terminates in the cacti.

The syringas and the myrtles are first cousins. The myrtles, in their turn, produce the fireweeds or evening-primroses, on the one hand, and the cacti on the other. The latter possess a large number of petals and stamens, probably associated with the storage of water in the fleshy parts and the consequent assurance of a permanent supply of raw material.

THE HYDRANGEA IS A DAUGHTER OF THE ROSE

In like manner one might trace the descent of the aster and the sunflower from the rose. The hydrangea is a child of the rose, and from it is sprung the witch-hazel, which, in its turn, appears to be the forbear of the dogwood, that drops one of the two rows of stamens marking the witch-hazel flower.

The dogwood, in turn, is regarded as the immediate ancestor of the parsleys, or umbellifers, characterized by their umbrellalike clusters of flowers. It also gave rise to the elderberry, which is little more than a dogwood with united petals; and through it probably, by this fusion of petals, to the other honeysuckles and the madders. The latter, in their turn, producing regular flowers, are considered the ancestors of the teasels, bluebells, and asters.

A SUNFLOWER BLOSSOM IS A DENSE CLUSTER OF MINIATURE FLOWERS

The ancestral history of the asters can be traced only after it is realized that the sunflower, dandelion, chrysanthemum, and aster are not single flowers, but dense clusters of tiny blooms organized for collective bargaining with the bees. If a floret be pulled from the disk of gaillardia and examined it will be found to have a tubelike corolla and a papery calyx on top of the ovary, with a ring of stamens and a forked style, much as its ancestors—the bluebells, teasels, and madders. The parsleys proved the merit of coöperation when they developed umbels and passed this lesson on to their children and down to the generation of composites.

In like manner are the walnut and the maple traced back to the rose, and, through it, to the buttercup. We see the hydrangea rising out of the rose, and being transformed into a witch-hazel. One of the witch-hazel's probable offspring is the sumac, and the flowers of the simplest maples stamp them as descendants of this, in turn.

In the maple that is known as the box-elder, the goal of specialization has been reached, and the pistillate and staminate flowers are found on separate trees. In the birches and alders these flowers are grouped in catkins, and the staminate ones hold this form throughout. But the increasing parental care given the pistillate flower has brought about the disappearance of the catkin and a consequent specialization of the fruit seen in the beechnut, the acorn, the chestnut burr, and the walnut.

THE GERANIUMS SPRANG DIRECTLY FROM THE MALLOWS

Another offshoot of the buttercup that has founded a numerous and diverse family is the mallow. The simpler mallows still proclaim their parentage by the retention of their separate pistils, while the fruits of the "cheeses" indicate that union

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CROWFOOT FAMILY (*Ranunculaceae*): (1) Buttercup, *Ranunculus californicus* Benth.; (2) Red Columbine, *Aquilegia truncata* F. & M.; (3) Blue Larkspur, *Delphinium parryi* Gray; (4) Scarlet Larkspur, *Delphinium cardinale* Hook.; (5) Monkshood, *Aconitum columbianum* Nutt.

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POPPY FAMILY (*Papaveraceae*): (1) Creamcups, *Platystemon californicus* Benth.; (2) Wind Poppy, *Papaver californicum* Gray; (3) California-poppy, *Eschscholtzia californica* Cham.; (4) Bush Poppy, *Dendromecon rigidum* Benth. FUMITORY FAMILY (*Fumariaceae*): (5) Pink Dicentra, *Dicentra formosa* DC.; (6) Golden Eardrops, *Dicentra chrysantha* H. & A.; (7) Golden Corydalis, *Corydalis aurea* Willd.

of the pistils is still incomplete in even more advanced mallows.

From the mallow sprang the geranium, and the ancestral symmetry of its mallow and buttercup forbears is written clearly in the geraniums of meadow and woodland, but is being effaced in the cultivated species, which are properly called pelargoniums. In the simplest types of these the petals exhibit some uncertainty as to their proper position and form, but such species as the ivy and rose geraniums have taken a decisive step in the direction of dividing up the work of the corolla. The petals are arranged in groups, with two above and three below, and differ in size, shape, and markings. One of the sepals becomes a spur for nectar storage.

When the petals become still more differentiated and the sepal spur drawn out longer into a nectary, the pelargonium becomes a nasturtium, which is the missing link between geraniums, on the one hand, and balsams and touch-me-nots on the other. In the latter the spurred sepal has turned into a large cornucopia, at the expense of the other four, which are on the point of disappearing. In the case of the petals one has outgrown the others, and they have become fused with it, making a flower riddle that only the careful botanist has been able to solve.

The immediate descendants of the geraniums, in one line, are the wintergreens and pipsissewas, of the heath family, and they still exhibit the ancestral hallmarks in the double ring of stamens, in the number of pistils and in the lobing of the ovary. The fusion of the petals and sepals has barely begun in them, but proceeds rapidly in the other heaths, and becomes marked in the perfect bells of the blueberry and heather.

As the descendant species of the geranium branch of the buttercup family multiply, we see one group becoming gentians. They bear a close resemblance to another family, the phloxes. In these the union of the corolla is universal. Some of them, including the morning-glories and the potatoes, compensate for this improvement in the corolla by making a corresponding reduction in the number of pistils, producing an ovary with but two or three cells. A few of the phlox's descendants through the potato line developed two-lipped corollas, and thus became ancestors of the snapdragons, foxgloves, butter-and-eggs, trumpetcreepers, and catalpas.

We see the borages rising almost imperceptibly out of the phloxes, and in the guise of heliotropes, forget-me-nots, mertensias, puccoons, and others, passing with as little demarcation into the verbenas and the mints.

The borages, verbenas, and mints alike exhibit the same solution of the problem of securing one-seeded fruits, with all their advantages. The borages divided the two cells of the ovary so as to make four one-seeded nutlets, and the experiment proved so successful that it has been followed both by the verbenas and mints.

The mints are the last and highest of this branch of the descendant flowers of the geraniums and wear the royal blues and purples and fine perfumes that go with their patrician rôle. In them we see attained the final goal in the improvement of the corolla, the division of labor and the reduction of stamens and pistils, and especially in the production of fewer and better seeds.

BUCKWHEATS ARE NEAR RELATIVES OF PINKS

Again we go to the geranium and see the flax and the oxalis emerging from its household, possessed of the family coat of arms, but departing from the family habits in their manner of blooming and in the possession of podlike fruits.

In turn, the step from flax and oxalis to pinks is a short one, the flowers being essentially similar in their main features. Here we see a growing tendency toward conservation of energy and materials, as expressed in the reduction of the number of pistils, the elimination of cross-walls, the disappearance of the corolla, and the adjustment of the flower to wind pollination.

The garden pinks have risen from the geranium by making a short cut to a united corolla through the fusion of the sepals into a tube. The pinks are to-day one of the most active of the flower families in turning from insect to wind pollination.

The main line of descent from the pinks leads to the buckwheats, four-o'clocks, amaranths, and goosefoots, the latter including the sugar beet, chard, and spinach. Bidding for wind pollination, the showiness of the flower has all but disappeared

in most of them, but the common buckwheat and the four-o'clocks seem to have returned to the habits of their ancestors after the loss of the corolla. The calyx in the four-o'clock now does the work of the lost corolla and produces the brilliant colors and rich nectar that prove irresistible to humming bird, sphinx moth, and honeybee.

If space permitted, one might trace the poppies, and through them the Dutchman's-breeches and the bleeding-hearts, from the buttercups; pause to note how the primroses and pinks have sprung from the pinks through the union of petals and the reduction of stamens; how the portulacas and springbeauties have arisen in another direction, and how the tamaracks, willows, and poplars have taken a third line after leaving the pink's household.

To the casual observer the genealogies of the flower world may seem mystifying; but to the student, pistil and stamen, corolla and calyx, become as eloquent in the relation of the story of a flower's descent as do wills and deeds, family Bible entries, and epitaphs in the tracing of a human being's ancestry.

A NEVER-CEASING STRUGGLE MARKS THE LIFE OF FLOWERS

They tell of a never-ceasing effort of the flower to make the most of its opportunities, clothing the soil of the earth with a wondrous raiment, dressing itself in costumes suited to the needs of its station, its situation, its hours, and its ambitions. They tell of as careful attention to the requirements of its environment as milady gives to dressing, according to occasion; of as sustained a purpose to meet competition and to master changing conditions as the business magnate gives in his affairs; of as earnest an effort to reduce waste and set up economical operations as the manager of any public-service corporation puts forth in behalf of his plant.

And the result of these strivings—unconscious efforts though they may be in terms of human thought—is to add beauty to the world and to promote the well-being of its creatures.

Nor has the book of their progress been closed. Specializations and advancement continue to-day, and probably will for eons to come. Each of the three great centers of plant descent from the buttercup—the lily, the rose, and the geranium—has provided two lines of posterity, the one insect-pollinated and the other wind-pollinated, which have ended respectively in the six highest types of efficiency among the flowers—the orchids, asters, and mints, on the one hand, and the grasses, walnuts, and goosefoots on the other.

THE PLANT BREEDER SPEEDS UP NATURE'S PROCESSES

Nature, in her slow and patient way, is still developing her flower children; but the plant breeder, learning how she has operated to produce the changes recorded in the foregoing pages, speeds up the process under the compulsion of human need.

Under his entreaty they have been greatly improved in size, color, and form—most of all by doubling, a phenomenon rare in Nature, but common in the garden. The novelty of double flowers has appealed to flower lovers in all climes, perhaps since the first lake dwellers cultivated plants among the mountains of Switzerland; and it is probably only a question of time and interest until all of our common garden varieties exhibit double forms.

This advance operates upon the community of flowers in the asters as readily as it does in the violet or petunia, and marks a new period of specialization and evolution under the influence of man.

But the basic principles of conservation of energy and division of labor operate as well in the man-controlled garden as in the Nature-dominated field. Constant improvement of the flower of a lily often leads to the loss of power to produce seeds, but is compensated for by the increased size of bulbs.

In double flowers the stamens and the pistils are gradually converted into petals to the point of their total disappearance, with consequent loss of seed-producing power. In the prize chrysanthemums, dahlias, and zinnias the disk florets of the head are transformed into ribbonlike corollas, and reproduction must come from cuttings.

The plant breeder's art is but a revelation of the plasticity of the flower in the hands of its environment and affords us some idea of the forms the flowers of the ages ahead will take.

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CAPER FAMILY (*Capparidaceae*): (1) Bladderpod, *Isomeris arborea* Nutt. MUSTARD FAMILY (*Brassicaceae*): (2) Western Wallflower, *Erysimum asperum* (Nutt.) DC.; (3) Wild Radish, *Raphanus sativus* L. VIOLET FAMILY (*Violaceae*): (4) Yellow Violet, *Viola glabella* Nutt.; (5) White Violet, *Viola blanda* Willd.; (6) Purple Violet, *Viola canina* L.; (7) Pansy Violet, *Viola pedunculata* T. & G. MILKWORT FAMILY (*Polygalaceae*): (8) Milkwort, *Polygala californica* Nutt.

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MALLOW FAMILY (*Malvaceae*): (1) Bush Mallow, *Malvastrum fasciculatum* (Nutt.) Greene; (2) Mission Mallow, *Lavatera assurgentiflora* Kell.; (3) Checkerbloom, *Sidalcea malvaeflora* (DC.) Gray. GERANIUM FAMILY (*Geraniaceae*): (4) Wild Geranium, *Geranium incisum* Nutt. WOODSORREL FAMILY (*Oxalidaceae*): (5) Yellow Oxalis, *Oxalis corniculata* L.; (6) Pink Oxalis, *Oxalis oregona* Nutt. FLAX FAMILY (*Linaceae*): (7) Blue Flax, *Linum perenne* L.

WILD FLOWERS OF THE WEST

THE 32 color plates accompanying this article, and the biographies describing the wild flower life of the Pacific Coast are from the brush and pen, respectively, of Edith S. Clements. She has caught the spirit of the flowers alike with her pigments and her pen.

While the majority of the Pacific Coast flowers have never been able to cross the deserts and climb the mountains which separate them from the Mississippi Valley and the Atlantic seaboard, most of them have such close affinities with eastern wild flowers that their differences are apparent only to the trained botanist.

This is true alike among the buttercups, violets, mallows, geraniums, heaths, gentians, phloxes, mints, roses, peas, honeysuckles, asters, lilies, and other families represented, and the eastern reader will find many a delightful surprise in comparing these western flowers with those familiar in his own fields and forests.

In nomenclature it was decided to follow the author's preferences. Both in the matter of family groupings and common names, there is a wide range of opinion among botanists. For instance, some scientists make the lily family include the lilies, the lilies-of-the-valley, the trilliums, and the smilaxes. Others subdivide the plants into two, three, and even four families. Gray classifies all four groups as the same family. United States Government botanists set up three families—lily, lily-of-the-valley, and smilax; Britton and Brown subdivide them into four different families, setting up the trillium group as worthy of family rank. Similar differences of opinion exist with respect to the rose family, the crowfoot family, and others.

The same situation applies to the choice of common names. One authority will call *Epilobium angustifolium* great willow herb; another denominates it fireweed; a third blooming sally. Some authorities call *Isomeris arborea* bladderpod; others propose the name burro-fat.

The story of the descent of flowers, as graphically shown in Plate I and as related in the body of the preceding article, represents the conclusions of many botanists who have specialized in the field of floral relationships, and constitutes a working hypothesis which ascertained facts seem to justify and upon which further researches are being made.

By Edith S. Clements

With Illustrations in Color from Paintings from Life by the Author

CROWFOOT FAMILY

Ranunculaceae

Buttercup (*Ranunculus californicus* Benth. Plate II, figure 1).—From February to May, low grassy hills near the coast of California and southern Oregon are spread with a cloth of pale shining gold, as the buttercup comes into bloom. The tall, loosely branched stems sway in the breeze with slender grace, bearing near their tips open clusters of many-petaled, fragile blossoms that reflect the sunshine from polished surfaces. But they will disappoint anyone who gathers an armful, for the glossy petals fall quickly and the beauty of the bouquet is gone, even though the buds may continue to open after the stems have been placed in water.

The flowers of buttercups spread their pollen lavishly for all comers, but bees buzzing abroad in search of honey must seek diligently for the nectar hidden in glands at the base of the petals. As they tumble about busily, the pollen-laden anthers brush against their bodies, covering them with yellow powder. Away they fly to visit other buttercups in quick succession, never satisfied until replete with honey and loaded with pollen.

Some of the flowers are older and, instead of depositing pollen on the bee, remove some that he already carries, for the group of pistils in the very center of the blossom now have sticky tips that come in contact with the powdery mass on legs and body. This is a wasteful method of securing cross-pollination, but if the flower had learned better it would not be a simple buttercup.

Buttercups are lovers of sunshine and, shunning the shadows of the woodlands, care not whether their roots are in the drier soil of roadside and mountain meadow or in the mud of marsh and pond. They often seem quite unlike in their various homes, but it has been possible by means of careful experiment to grow some of them in different situations and make them indistinguishable from each other.

Many buttercups possess an acrid juice in stem and leaves that blisters the mouths of cattle venturing to eat them when feed is scarce. European beggars rub their skins with the juice and purposely produce hideous imitations of sores in order to arouse sympathy. The ancients used it for removing birthmarks and as a last recourse in cases of leprosy.

Buttercup seeds have been found useful by the Indians, who parch them and grind them up with other seeds into a flour that is eaten without further cooking. The bitter taste disappears under this treatment and the meal has the flavor of parched corn. The flowers also yield a considerable amount of early honey.

Buttercups have long been cultivated, many of them doing well as aquatics or in moist corners of the rock garden, while others are suitable for borders. The great favorite is an Asiatic species (*Ranunculus asiaticus*) called the Persian buttercup and mentioned in literature as far back as 1629, but greatly improved since that time, both in size and tint of the blossoms. These exhibit nearly every color except blue, and some varieties are striped and variegated. The doubling of the petals may go so far as to produce flowers almost spherical in form and two inches in diameter, very unlike the familiar buttercup of field and meadow.

Red Columbine (*Aquilegia truncata* F. & M. Plate II, figure 2).—The brilliant red and yellow blossoms of the columbine sway at the tips of slender bending stems like gay butterflies on the wing. Unlike butterflies, they shun the sunshine, and during spring and early summer brighten the dusk of shady places with spots of vivid flame. To the casual observer, the oddly shaped flowers give no hint of their near kinship to the common yellow buttercup, or even to larkspurs and monkshoods; but hanging down beneath the pendant flower, well protected against sudden showers, is the cluster of many stamens and pistils that announce, as plainly as words, that columbines also are members of the oldest of flower groups—the buttercups.

In spreading a feast of honey, the columbine is less extravagant than the meadow buttercup, but more generous than its other cousins, the larkspur and monkshood, for it provides a nectary in each of the five upright spurs at the ends of the petals. Short-tongued bees find it impossible to sip the nectar while clinging to the mass of stamens, so they often make use of the holes that lazy bumblebees have bitten in the spurs, and follow their example in stealing the hidden sweets. Bumblebees and most humming birds find no difficulty in helping themselves in the usual way and thus transferring the pollen.

The red columbine is widely distributed throughout the Pacific coast, ranging as far north as Alaska and east to Montana and Utah, and may be found in thickets and woodlands from sea level to timber line. The eastern red columbine (*Aquilegia canadensis*) has smaller flowers of a less brilliant hue and prefers somewhat more open situations. Colorado's State flower, the blue columbine (*Aquilegia caerulea*), is very large-flowered, blue and white or occasionally pure white, and often grows in dense masses in grassy openings of the spruce woods of the Rockies. The common garden columbine (*Aquilegia vulgaris*) has been brought over from its native haunts in Europe and, since it hybridizes readily, produces a great variety of forms and colors. Whether wild or naturalized, all species might well be grown for the sake of the flowers in the early part of the season and the delicate foliage after the blooming is past.

Blue Larkspur (*Delphinium parryi* Gray. Plate II, figure 3).—From April until June the wild flowers of southern California fling a magic carpet of rainbow colors over hillsides and mesa. Scattered here and there in the mass of pink abronias, purple ice plants, yellow evening-primroses, and saffron cactus blossoms, the spirelike stalks of larkspur are densely clustered with dark purple-blue flowers. In the shade of the chaparral the stems reach a height of three feet and produce but a few unusually large flowers, while in sunny exposed spots they are rarely more than a foot high and the blossoms are crowded into a long spike.

This blue larkspur is found only in southern California in the chaparral and on grassy hillsides, but several related forms extend throughout the State and into Washington, varying in the color of their blue and in minor features.

It greatly resembles also the tall larkspur (*Delphinium exaltatum*) of the East, which is dark blue with yellow on the upper petals. In meadows and prairies east of the Rocky Mountains may be found a larkspur (*Delphinium azureum*) of a delicate azure paling to white. There are other species and varieties growing wild in this country, and all may be recognized by the peculiar shape of the upper sepal, which resembles the spur of the lark.

A number of native larkspurs are poisonous to cattle, somewhat less so to horses, and not at all harmful to sheep, which seem able to indulge in them freely. An extract made from the seeds of the field larkspur (*Delphinium consolida*) of Europe is poisonous if taken internally, but is useful as an ointment or lotion.

Cultivated larkspurs afford a large number of beautiful forms and colors, varying from white through all shades of blue, lavender and purple, pink, and even yellow and scarlet. They may be single-flowered or very greatly doubled, perennial or annual; so that the range offered for individual choice is unusual.

Scarlet Larkspur (*Delphinium cardinale* Hook. Plate II, figure 4).—Like flaming torches scattered through the dry chaparral of early summer, the scarlet larkspur startles one with its vivid beauty. Blooming after the rains are over and when other flowers have mostly disappeared, its usual companions are tall yellow senecios, rose-colored live-forevers, creamy cacti, and pale salvias.

Whether surrounded by the dark green or gray shrubs of the coastal sagebrush, or standing solitary in broad river plains or stony streamways, the nearly leafless stems shoot up to a height of six feet or more and are tipped with long spikes of brilliant scarlet-vermilion blossoms.

Little sister to this superb specimen of the south, another red larkspur (*Delphinium nudi-*

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ROCKROSE FAMILY (*Cistaceae*): (1) Sunrose, *Helianthemum scoparium* Nutt. ST. JOHNSWORT FAMILY (*Hypericaceae*): (2) St. Johnswort, *Hypericum perforatum* L. PINK FAMILY (*Caryophyllaceae*): (3) Indian Pink, *Silene laciniata* Cav. PURSLANE FAMILY (*Portulacaceae*): (4) Red Maids, *Calandrinia caulescens* (Hook.) Gray. FOUR-O'CLOCK FAMILY (*Nyctaginaceae*): (5) Pink Abronia, *Abronia umbellata* Lam.; (6) Yellow Abronia, *Abronia latifolia* Esch.; (7) Wild Four-O'clock, *Mirabilis californica* Gray. BUCKWHEAT FAMILY (*Polygonaceae*): (8) Wild Buckwheat, *Eriogonum fasciculatum* Benth.

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HEATH FAMILY (*Ericaceae*): (1) Bog Kalmia, *Kalmia polifolia* Wang.; (2) Yellow Heather, *Phyllodoce glanduliflora* Cov.; (3) Red Heather, *Phyllodoce empetriformis* Don; (4) Blueberry, *Vaccinium caespitosum* Michx.; (5) Box Blueberry, *Vaccinium ovatum* Pursh; (6) Manzanita, *Arctostaphylos tomentosa* (Pursh) Dougl.; (7) Salal, *Gaultheria shallon* Pursh; (8) Western Azalea, *Rhododendron occidentale* Gray. INDIANPIPE FAMILY (*Monotropaceae*): (9) Snow Plant, *Sarcodes sanguinea* Torr.

caule) hides itself in cool canyons of the Pacific coast and reflects the differences in its home environment by producing fewer flowers on shorter stems.

Larkspurs have come to be quite partial to bumblebees, and their nectar is so well protected by the spur which forms an extra covering for the honey sacs that smaller bees cannot bite through and steal it.

So rapidly does the honey flow and so busily do the bumblebees work that they are able to visit the same cluster of blossoms several times in succession. Red larkspurs also attract humming birds, which seem partial to this color, and their long bills are well adapted to extract nectar from the slender spurs.

Monkshood (*Aconitum columbianum* Nutt. Plate II, figure 5).—Like sentinels on guard, the slender spikes of monkshood stand straight and tall among the grasses and herbs of moist mountain meadows. On shady brook banks they stretch up to a height of six or eight feet and grow in closely clustered groups with other moisture-loving plants.

Birches and maples form an arching canopy, and in their cool shadows, with roots reaching down toward the waters of the rushing brook, the dark blue-purple or white spikes of monkshood bloom through the summer, with rose-purple fireweeds and huge white-flowered cow-parsnips as their companions.

Like the columbine and larkspur, the monkshood conceals its relationship to the buttercup by a fanciful disguise. Instead of wearing a saucy dunce's cap, as the larkspur does, it masquerades in a queer blue bonnet with floating ribbons. Peeping beneath the hood, one expects to see a tiny face, but finds instead the familiar cluster of stamens and separate pistils so characteristic of the buttercups.

The nectaries are neatly tucked away in the upper cowl-shaped sepal and take the form of tiny cornucopias on slender stalks. Long tongues are necessary to reach the honey, and so dependent are monkshoods on the services of the bumblebee that their very existence is at stake. It is a curious fact that countries, such as New Zealand, Australia, Arabia, and South Africa, which have no native bumblebees, also lack native monkshoods.

The bee alights on the ribbonlike lower sepals, grasps the side sepals with its front legs, and, as it sucks the nectar, moves its body back and forth over the stamens and stigmas. Besides helping itself to the honey so freely offered, it scrapes off the pollen clinging to head and body, packs it into pollen baskets in its legs, to be carried home and made into pollen bread for the baby bees.

Like its relative, the larkspur, the monkshood is careful of its pollen, not only protecting it against wetting, but ripening the anthers by twos and fours and thus maintaining a continuous supply for a week or more.

With the exception of southern California, the blue monkshood may be found throughout the West. There are several species in the Alleghenies that may also be quickly recognized by the peculiar helmet-shaped sepal.

The cultivated monkshood (*Aconitum napellus*) yields the drug aconite, which is used in medicine in various ways. Since many of the species have this poison in flowers as well as roots, they should never be planted near the kitchen garden or the children's garden. Otherwise, they are attractive and satisfactory garden plants, affording ornamental foliage as well as flowers.

POPPY FAMILY

Papaveraceae

Creamcups (*Platystemon californicus* Benth. Plate III, figure 1).—Strikingly like pale buttercups in form and structure, the light yellow blossoms of creamcups flutter airily in the sea breezes and spread a riot of springtime bloom in the sandy soils of shore, field, and roadside. They are often at their best on dunes, where they are companioned by pink abronias, yellow senecios, golden California-poppies, and baerias.

Wherever there is space, the plants are spreading, from six to nine inches tall, with numerous hairy branching stems and many flowers. In the adobe soil of cliffs, where water is harder to get than from loose sand, the entire plant becomes dwarfed, with but one to three stems two or three inches high, tiny blossoms, and small leaves only at the base. When growing in the shade of shrubs or overtopped by other herbs, the plants reach toward the light to a height of 15 inches or more and are thin-leaved and sparsely hairy, with larger flowers.

Usually the blossoms are a pale straw color or creamy white and the petals cupped, so that the common name is not only pretty, but descriptive.

Though creamcups are placed in the same group with the poppies, they actually occupy the borderland between these and buttercups, sharing the features of both.

Wind Poppy (*Papaver californicum* Gray. Plate III, figure 2).—The vermilion-red disks of the wind poppy glow here and there like bright flecks of flame in the shelter of the chaparral-covered slopes or in shady dells. They bloom throughout the spring in central and southern California and on Mount Tamalpais, but are so fragile that the petals fall at a touch. Unfortunately, the seeker after spring blossoms may not know this, and many a delicate beauty has been plucked only to be at once thrown aside.

So far as known, all the poppies produce poisonous alkaloids, and children especially should be warned against tasting or chewing any part of the plant. The opium poppy is of considerable value in commerce, the seeds yielding an oil that is used as a substitute for olive oil in cooking and as a drier in painting. Opium is obtained from the milky juice of the seed pods. Besides being used as an intoxicant, it is valuable as morphine for relieving pain and inducing sleep.

California-poppy (*Eschscholtzia californica* Cham. Plate III, figure 3).—Magic carpets of gold are flung far and wide over hillside and valley as the California-poppy comes into bloom. At the height of its glory, in the spring, when

the winter rains have been seasonable and sufficient, the blossoms may cover many square miles so thickly as to be visible at great distances. One poppy bed, 20 miles long by 10 wide, has been seen as a sheet of yellow from a peak 40 miles away. Another, composed entirely of the orange-red variety, was of such brilliant hue and so thickly sown as to look from afar like the bare red earth of a great Permian exposure.

The California-poppy is exceedingly variable in all its parts. The color may range from white, turning to pink with age, through all shades of yellow, from pale lemon to pure canary and deep orange-red. The various forms are sometimes named as different varieties or even species; but, whether kept separate or grouped together, these "cups of gold," as the Spaniards called them, are at home along the coast and in interior valleys, in sand and dunes of the seashore, in bunchgrass prairies, along roadsides, and in fields throughout California, northward to Oregon and Washington, south into Mexico, across the Colorado Desert and Arizona, and eastward into New Mexico.

For more detailed information concerning California's State flower, see the National Geographic Society's publication, "The Book of Wild Flowers."

Bush Poppy (*Dendromecon rigidum* Benth. Plate III, figure 4).—With its wealth of large, bright yellow flowers and grayish green foliage, the bush poppy lends a sunny aspect to the chaparral, even on cloudy days. It is especially fond of burned-over ground and often occupies this quickly and completely, though it usually occurs as scattered individuals here and there among the shrubs of southern and middle California.

Poppies are known as pollen flowers, since they have no nectar and rely on an abundance of this golden powder to attract their insect friends. The flowers of the bush poppy have a fresh smell like cucumbers, but are ornamental only if left undisturbed, for the petals fall soon after the blossoms are picked. This habit of the poppy flowers has been immortalized by Robert Burns' poem, in which the fleeting nature of pleasure is likened to the quick destruction of the poppy blossom when plucked.

These plants exude a bitter milky juice which, like all milky saps, has enjoyed some popular repute in the removal of warts. An oil extracted from the seeds has a use similar to that of castor oil.

FUMITORY FAMILY

Fumariaceae

Pink Dicentra (*Dicentra formosa* DC. Plate III, figure 5).—The pale waxen flowers of the pink dicentra hang pendant from curving stems and brighten shady places here and there in moist woods. The diligent seeker for shy blossoms may find these through the summer in favored spots of the Coast Ranges and in the Sierra Nevada up to 9,000 feet. They are especially large and showy in Paradise Valley, but in the Yosemite may be easily overlooked, since the plants are seldom found in flower, although the delicate gray-green leaves beautifully cut into a graceful fringe are sufficiently attractive in themselves.

The dicentra of the East (*Dicentra cucullaria*) is called Dutchman's-breeches, and, although the dainty blossoms are white or pale pink, their two petals, baggy at one end and tapering to two narrow extensions, look for all the world like this picturesque apparel hung upside down on a clothesline. This is one of the earliest harbingers of spring in the woods of the Allegheny Mountains and westward to Kansas, Nebraska, and Missouri.

Only recently has this charming plant been found to be dangerously poisonous to stock, although long known in certain localities as staggerweed, because of its effect on cattle grazing upon it. Another common eastern relative (*Dicentra canadensis*) is a white-flowered form with pink tips, called squirrel-corn because of its many small tubers.

Golden Eardrops (*Dicentra chrysantha* H. & A. Plate III, figure 6).—Standing up stiffly here and there in the chaparral, the tall yellow-green stems of this yellow dicentra bear aloft loose clusters of golden blossoms that perch jauntily erect instead of drooping gracefully, like other bleeding-hearts. In contrast to the stiff stems, often five feet tall, the finely cut, fernlike leaves, a foot or more long and a pale shining green, seem unusually graceful.

The plants are not very abundant, but may be found scattered through sandy washes and in the chaparral of central and southern California, blooming in May and June.

Golden Corydalis (*Corydalis aurea* Willd. Plate III, figure 7).—A lover of the open spaces, the golden corydalis covers gravelly soils with masses of feathery foliage and adorns them with loose clusters of bright yellow blossoms on delicate stems. When moisture is lacking, the plants may become dwarfed to an inch or two in height, but where conditions permit luxuriant growth a single plant may grow a foot tall and cover an area two feet across.

The genus is closely related to the bleeding-heart and Dutchman's-breeches, though it has but one spur and the flowers are yellow instead of pink. The earliest blossoms appear in March, and in the mountains laggards may be found in late summer and early autumn.

CAPER FAMILY

Capparidaceae

Bladderpod (*Isomeris arborea* Nutt. Plate IV, figure 1).—Dotted over hills and cliffs of southern California and extending to the edge of the desert, the low shrubs of the bladderpod, with their smooth green leaves and loose clusters of clear yellow flowers, add a pleasing note to the uniform gray of the coastal sagebrush.

Though the flowers themselves are not ill-smelling, the bruised foliage has a strongly pungent odor that is distinctly unpleasant to most people, and thus enables this species to become a member in good standing of the "Flower Self-Protective Association."

A distinctive characteristic of the plant is its large leathery pods, which droop on long stalks

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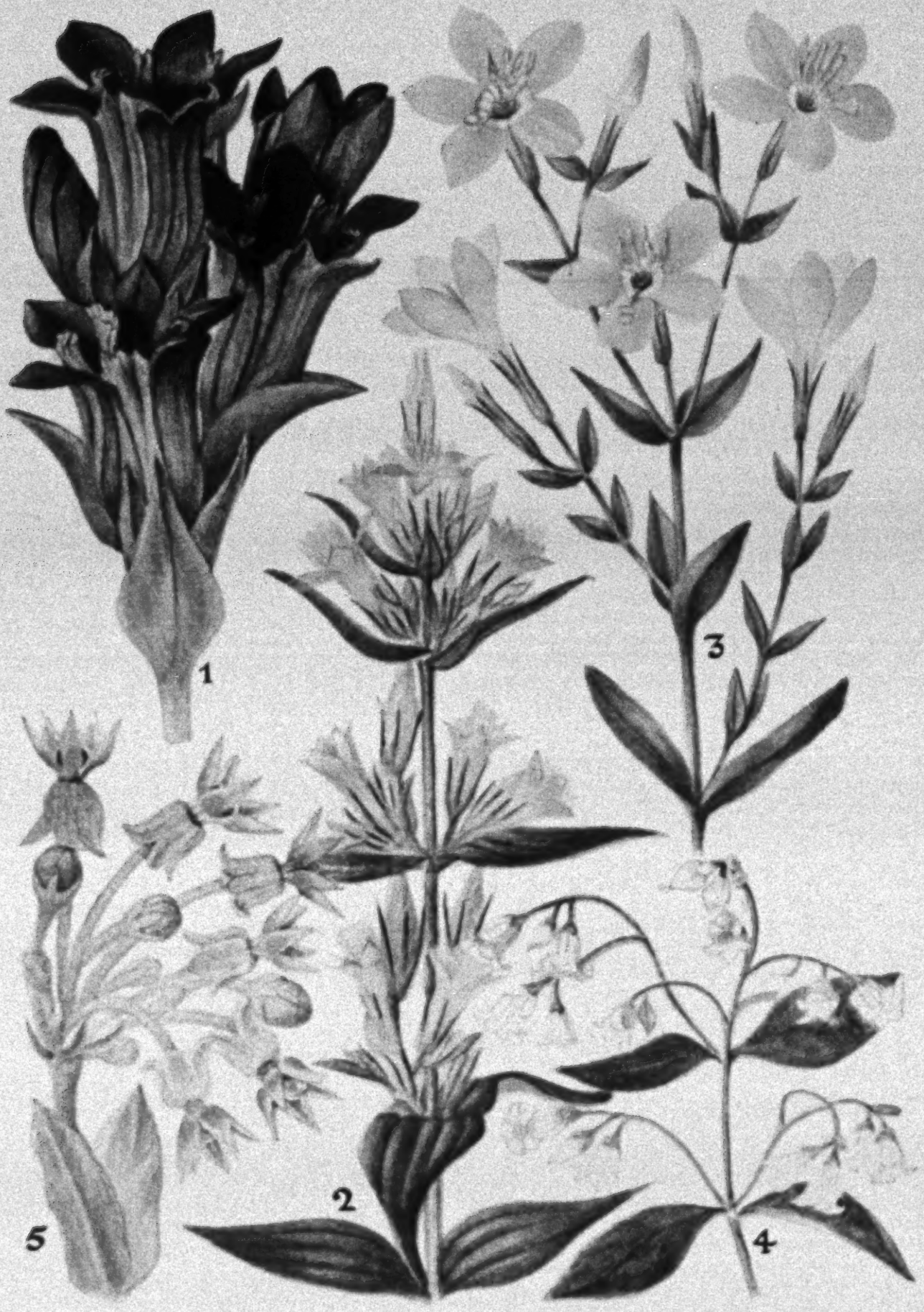
WINTERGREEN FAMILY (*Pyrolaceae*): (1) Pink Pyrola, *Pyrola rotundifolia* L.; (2) Pale Pyrola, *Pyrola minor* L. PRIMROSE FAMILY (*Primulaceae*): (3) Scarlet Pimpernel, *Anagallis arvensis* L.; (4) Shootingstar, *Dodecatheon meadia* L.; (5) Starflower, *Trientalis europaea* L. LEADWORT FAMILY (*Plumbaginaceae*): (6) Sea-thrift, *Armeria vulgaris* Willd.



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GENTIAN FAMILY (*Gentianaceae*): (1) Blue Gentian, *Gentiana calycosa* Griseb.; (2) Rose Gentian, *Gentiana amarella* L.; (3) Erythraea, *Erythraea venusta* Gray. DOGBANE FAMILY (*Apocynaceae*): (4) Dogbane, *Apocynum androsaemifolium* L. MILKWEED FAMILY (*Asclepiadaceae*): (5) Showy Milkweed, *Asclepias speciosa* Torr.

and contain two rows of bitter, pealike seeds. The name refers to these fruits, which are not only bladderlike in shape, but also inflated with air, and, like other bladdery fruits, they will crack with a popping sound if crushed when ripe. The plants are propagated by cuttings rather than by seeds and are sometimes cultivated in England.

Besides the bladderpod, the caper family furnishes the French capers (*Capparis spinosa*) of the table. These spicy delicacies, with an aromatic odor and pungent taste, are the unopened buds of the plant, preserved in salt and vinegar, which the connoisseur considers an indispensable adjunct to many sauces and salads.

Near relatives that are useful because of their nectar, and that also add to the joy of living by their beauty, are the lilac-colored Rocky Mountain bee-plant (*Cleome serrulata*) and its sister, the yellow cleome (*Cleome lutea*).

MUSTARD FAMILY

Brassicaceae

Western Wallflower (*Erysimum asperum* [Nutt.] DC. Plate IV, figure 2).—The chief charm of the western wallflower lies in the range of lovely color disclosed by its globelike clusters of flowers. This runs the gamut of yellows, from a clear lemon-color through canary and golden yellow to bright orange or deep burnt-orange. It grows in the sandy soil of dry plains and washes or seeks shelter from the sun amid the shrubs of the chaparral or the forests of the mountains. It is a ready traveler and has taken up homestead claims throughout the West, venturing north to British Columbia, south to Mexico, and east as far as Texas, Arkansas, and Minnesota.

Wild Radish (*Raphanus sativus* L. Plate IV, figure 3).—When the garden radish escapes from its cultivated enclosure, it takes to the open with a profusion of bloom that is the glory of vacant lots in western California. Masses of the purple blossoms are most effective in the landscape, as they riot over waste fields in spring and early summer.

The clusters may seem marred because of the wide spacing of the flowers on the stem and the ragged appearance of the seed pods, yet this only serves to call closer attention to the individual blossoms.

Products of the mustard family appear on nearly every table, and scarcely a meal is eaten that does not include some representative in its bill of fare. Cabbages, Brussels sprouts, kale, cauliflower, and turnips rank high in adding vitamins and bulk to the daily diet, while horseradish and mustard spur the jaded appetite.

VIOLET FAMILY

Violaceae

Yellow Violet (*Viola glabella* Nutt. Plate IV, figure 4).—The small yellow violet, with its smooth thin leaves, is not abundant, although widely distributed in the moisture and shade of thickets and woods in the Coast Ranges and Sierra Nevada from central California to Alaska and Alberta.

The yellow violet of eastern woods (*Viola pubescens*) is a close relative, as is shown by its leafy stems and fondness for the shade. It also agrees in being much more sparing of its flowers than the blue violets, only a few blooming at a time along the erect stems.

White Violet (*Viola blanda* Willd. Plate IV, figure 5).—Boggy meadows and cold springs in the mountains are the favorite haunts of this tiny fragrant white violet, so faintly tinged with blue lavender.

Although nowhere abundant, this white violet ranges widely in mountain valleys from the Sierra Nevada to Alaska and eastward to the Rockies and Atlantic. The white violet (*Viola canadensis*) of northern and eastern woods is considerably larger and may be recognized by the yellow center and the violet tint on the outside of the petals.

Purple Violet (*Viola canina* L. Plate IV, figure 6).—Hiding shyly among the grasses of moist mountain meadows and concealing its blossoms beneath broad leaves of delicate green, the small woodland violet of deepest purple hue may be found in wet meadows and swampy places of the Northern Hemisphere the world over, seeking half bogs in southern California, the shade of shrubs near the coast, and that of pines or tall grasses in the Tuolumne Meadows of the Yosemite.

The popular violets of the East are all blue-flowered and borne on slender leafless stalks. The butterfly-violet (*Viola papilionacea*) loves the borders of woodland and thicket, and the birdsfoot violets (*Viola pedata* and *V. pedatifida*) lend a blue tinge to meadow and prairie in the height of spring. These are the most flowery of all violets, the leaves often being smothered in a mass of blue blossoms.

Pansy Violet (*Viola pedunculata* T. & G. Plate IV, figure 7).—The bright golden flowers of the pansy violet smile cheerily on the sunny hillsides of southern California through March and April. They seek the sunshine and, if growing in the shade of the chaparral, stretch up toward the light, sometimes to a height of two feet. Where there is plenty of room and moisture in bare sandy spots, leafy rosettes appear at short intervals along the runners and soon carpet the ground, the stems bearing blossoms at six or eight inches. If the seeds germinate where the soil is too dry for luxuriant growth, the plants become stunted, as do all living things that are undernourished, and are able to bear only small flowers on two- or three-inch stems.

The sprightly, wide-awake look gives point to the name of Johnny-jump-up, sometimes applied. Its fresh woodsy odor is very pleasant.

MILKWORT FAMILY

Polygalaceae

Milkwort (*Polygala californica* Nutt. Plate IV, figure 8).—The dainty little plants of the milkwort, with oddly shaped rose-purple blossoms, seek the shade or peep forth from the edges of woodlands. The flowers may well be taken for pea flowers or near relatives, since they, too, have wings and a keel, but the stand-

ard is wanting and close inspection will reveal other differences.

The two broad wings are brightly colored sepals which inclose the three inconspicuous petals. One of the latter is curiously fringed, thus affording the bee a foothold as it probes for the nectar. The entire method of pollination is intricate and unusual, but the flowers are not entirely dependent upon insect visitors. Like those other irregular flowers, the violets, the milkwort bears inconspicuous blossoms near the roots. These do not take the trouble to open at all, but are self-pollinated in the bud, opening only to free the imprisoned seeds.

MALLOW FAMILY

Malvaceae

Bush Mallow (*Malvastrum fasciculatum* [Nutt.] Greene. Plate V, figure 1).—The delicate rose-lavender flowers of the bush mallow nestle among soft gray leaves on wandlike branches and make the tall shrubs a distinctive feature of the hillsides and canyons in southern California. The fragrant blossoms appear in the spring and summer and look very like small hollyhocks. The dark crimson of the stamens forms a pleasing contrast to the paler petals, their number and habit of uniting the filaments into a column furnishing a clue to the relationship.

Resembling buttercups and poppies in abundance of stamens and the latter also in the loose union of the pistils, they find their place in the family tree near these groups.

The mallow family furnishes many favorites of garden and greenhouse, the hollyhock ranking first. The waxmallow (*Malvaviscus arboreus*) is attractive, not only because of its beauty, but also on account of its ease of growth and freedom from insects. Abutilon and hibiscus are other favorites.

Mission Mallow (*Lavatera assurgentiflora* Kell. Plate V, figure 2).—The brilliant rose-purple flowers with conspicuous dark veinings, together with the beautiful maplelike evergreen leaves of the mission mallow, justify the Franciscan monks in their choice of this shrub as an ornamental in their gardens. From these it has escaped and now runs wild throughout the coast region of California, though it may be found most abundantly in the northern part of the State.

The mission mallow is especially striking in the ravines and gullies of bold headlands, where it braves the salt spray, with the silvery saltbush for its companion. For this reason it is often employed as a windbreak for vegetable gardens near the sea. The plants are easy of cultivation and will grow from seed to a height of six feet, and flower within the year.

Checkerbloom (*Sidalcea malvaeflora* [DC.] Gray. Plate V, figure 3).—The spreading stems of the checkerbloom rise gracefully from basal clusters of geraniumlike leaves and bear exquisite rose-lavender flowers along their upper sides. Found along the coast as far north as Washington and eastward to Wyoming and Texas, they form an attractive feature of grassy hills and mesas in spring and early summer, offering an effective contrast to the stiff bunches of blue-flowered grass-irises.

GERANIUM FAMILY

Geraniaceae

Wild Geranium (*Geranium incisum* Nutt. Plate V, figure 4).—Brightening the margins of the Sierra woods with magenta blossoms or venturing forth along the roadsides, the wild geranium is a familiar sight in spring and summer, from the Yosemite north and eastward to the Rockies. The shade forms are taller, smoother, and thinner-leaved than the plants that prefer the sunshine, the latter often becoming small and hairy.

The eastern wild geranium (*Geranium maculatum*) finds its home in open deciduous woods from Canada to the Gulf of Mexico and from the Mississippi to the Atlantic. Its root furnishes the extract of geranium used in medicine as an astringent.

Near relatives of the geranium are the common nasturtium (*Tropaeolum majus*) and the garden balsam (*Impatiens balsamina*). In California the former often escapes and turns canyon floors into a kaleidoscope of color.

The garden balsam may be found growing wild in shady woods of the East and as far west as Kansas and Nebraska. It is sometimes known as "touch-me-not," since the ripe pods will snap at a touch and send the seeds in all directions.

WOODSORREL FAMILY

Oxalidaceae

Yellow Oxalis (*Oxalis corniculata* L. Plate V, figure 5).—The yellow woodsorrel dots lawns and gardens, and borders roadsides with masses of cloverlike leaves and bright flowers. It blooms all summer long and is widely distributed round the world as a number of named varieties, of which the common woodsorrel of the East (*Oxalis stricta*) is one.

In dry locations, both plants and blossoms are dwarfed, growing but an inch or two, while in the shade they stretch up to three feet and bear flowers half an inch across. Sometimes the foliage changes color and forms bronze mats on lawns or runs dark seams in the cracks of limestone copings.

The leaves have a pleasantly sour taste, due to the oxalic acid they contain, and also possess the interesting habit of folding their leaflets together at sundown and quietly going to sleep.

Pink Oxalis (*Oxalis oregona* Nutt. Plate V, figure 6).—Loving moist shade, the pink oxalis carpets openings in the forest with its abundant and attractive leaves borne on slender stalks. Scattered here and there amid the dense foliage, the white or pale pink flowers are quite inconspicuous, although considerably larger than those of the yellow oxalis (*Oxalis corniculata*). It ranges as far north as Washington and is especially abundant in redwood forests, while a near relative, the common woodsorrel (*Oxalis acetosella*), is widespread in cold, damp woods of Canada, our own East, Europe, Asia, and Africa.

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PHLOX FAMILY (*Polemoniaceae*): (1) Scarlet Gilia, *Gilia aggregata* Spreng.; (2) Globe Gilia, *Gilia capitata* Dougl.; (3) Birdseye Gilia, *Gilia tricolor* Benth.; (4) Buff Gilia, *Gilia grandiflora* Dougl.; (5) Prickly Gilia, *Gilia californica* Benth.; (6) Feather Gilia, *Gilia androsacea* Benth.; (7) Fringed Gilia, *Gilia dianthoides* Endl.; (8) Yellow Gilia, *Gilia aurea* Nutt.

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PHLOX FAMILY (*Polemoniaceae*): (1) Mountain Phlox, *Phlox douglasi* Hook.; (2) Alpine Polemonium, *Polemonium confertum* Gray; (3) Dwarf Polemonium, *Polemonium humile* Willd. POTATO FAMILY (*Solanaceae*): (4) Blue Nightshade, *Solanum umbelliferum* Esch.; (5) Tree Tobacco, *Nicotiana glauca* Graham. WATERLEAF FAMILY (*Hydrophyllaceae*): (6) Whispering Bells, *Emmenanthe penduliflora* Benth.; (7) Yerba Santa, *Eriodictyon tomentosum* Benth.

FLAX FAMILY

Linaceae

Blue Flax (*Linum perenne* L. Plate V, figure 7).—A field of heavenly blue flax is an enchanting sight early in the morning, as the fairy blossoms bend before the breeze on flexible stems. The petals fall before noon and the tiny-leaved plants become inconspicuous then until the new flowers bloom, the next morning. Whether one travels from the coast to the Rocky Mountains, from the Arctic Circle to Mexico, or through Europe and northern Asia, the blue flax nods a welcome from many a grassy field or shrubby hillside.

There are lovely yellow-flowering flaxes also, one with striking blossoms two inches across (*Linum berlandieri*), a native of Texas and Kansas, and smaller-flowering ones in the East (*Linum sulcatum*) and Middle West (*Linum rigidum*).

The flaxes have both geraniums and sorrels as their next of kin and they are also related to the pinks.

ROCKROSE FAMILY

Cistaceae

Sunrose (*Helianthemum scoparium* Nutt. Plate VI, figure 1).—The fleeting blossoms of the sunrose, starring low shrubby plants in the spring, are like yellow flaxes, to which, indeed, they are closely related. Not only are they similar in appearance, but they have the same habit of dropping their petals shortly after blooming. Instead, however, of being tall and slender, with single flexible stems, they are somewhat woody and quite green and stiff, with small, narrow leaves, forming low bushes which are suitable for garden borders.

This California sunrose is a hardy little pioneer in openings of the chaparral of the central and southern parts of the State and finds a foothold easily in burned-over areas. The frostweed (*Helianthemum canadense*), a near relative, which may be found in the northeastern part of the country, furnishes an interesting phenomenon on frosty autumn days. In the crisp air the sap, which exudes from cracks in the roots, freezes into glittering sheets of crystal. The popular rockroses of the garden belong to another genus (*Cistus*) in the same family.

ST.JOHNSWORT FAMILY

Hypericaceae

St.Johnswort (*Hypericum perforatum* L. Plate VI, figure 2).—Outlining roadsides with yellow bands or clothing fallow fields and pasture with gold, the St.Johnswort is more attractive to the onlooker than to the farmer. He finds it not only poisonous to his stock, but a troublesome weed and one very difficult to eradicate. It is a great traveler, having come to America from Europe, probably as a stowaway; then carried all over this country in the company of cereals and grains. The Rose of Sharon is a cultivated species. For further details, see the National Geographic Society's publication, "The Book of Wild Flowers," page 206.

PINK FAMILY

Caryophyllaceae

Indian Pink (*Silene laciniata* Cav. Plate VI, figure 3).—Here and there, in the shade of the chaparral or the tangled growth of canyons in southern California, the brilliant red blossoms of the Indian pink contrast vividly with their dark background. Like all shade-loving plants, the stems are often tall and slender and bear the flowers singly or loosely clustered. Both leaves and stems are covered with glandular hairs and feel sticky to the touch. Small insects, like gnats and mosquitoes, find this stickiness too much for their delicate structure, and wings and feet become so entangled as to hold them prisoners for life.

This characteristic is so much more marked in nearly related species as to win them the name of catchfly. The sleepy catchfly (*Silene antirrhina*) of the Yosemite and the East stays "awake" for but a short time in the sunshine, while the night-flowering catchfly (*Silene noctiflora*) wakes up at dusk and spends the entire night luring nocturnal moths to its fragrant whiteness.

The Indian pink is common in southern and Lower California, where it blooms in late spring and summer, and it has even traveled as far eastward as New Mexico. In central and northern California and southwestern Oregon, it is replaced by a twin sister (*Silene californica*).

PURSLANE FAMILY

Portulacaceae

Red Maids (*Calandrinia caulescens* [Hook.] Gray. Plate VI, figure 4).—One must be on the alert to get a view of the brilliant rose-purple flowers of red maids; for, besides being rather small and but one or two on each leafy stem, they open only in the sunshine. Moreover, they remain open only a few hours before wilting and deliquescing, and, if gathered, close within a few minutes and steadfastly refuse to open again.

Red maids may be found in meadows and grassy openings along the Pacific coast from British Columbia to South America, the stems growing quite tall when overtopped by grasses, but usually more or less recumbent in open ground.

A sort of poor relation is the common purslane (*Portulaca oleracea*), which has found its way along roadsides, into yards and fields everywhere.

Closely related are the springbeauties of the Middle West and eastward (*Claytonia virginica*) and that of the Northwest (*Claytonia lanceolata*).

FOUR-O'CLOCK FAMILY

Nyctaginaceae

Pink Abronia (*Abronia umbellata* Lam. Plate VI, figure 5).—Of all the gay flowers that carpet the strand with a cloth of many colors, none is more beautiful than the pink abronia. Its prostrate red or pink stems trail widely over the sand and send up thickish gray-green leaves and round-topped clusters of

bright rose-purple flowers that are the most striking feature of the shore in summer and early autumn. Thriving best in the salt sea air, they overlook the rolling Pacific from British Columbia to Lower California.

The desert abronia (*Abronia villosa*) is a species of striking beauty that covers the Colorado and Gila deserts for miles with a mass of fragrant pink bloom during favorable winters. It is smaller and more slender than the pink abronia of the coast, while the honey abronia (*Abronia mellifera*) of Washington and Oregon is stouter and the blossoms are large and white. The fragrant abronia (*Abronia fragrans*) of eastern Washington and the prairies and plains of the Middle West covers dry soil readily with its large clusters of white flowers that open at night and close in the morning.

Yellow Abronia (*Abronia latifolia* Esch. Plate VI, figure 6).—The bright clusters of small blossoms, thick trailing stems and erect leaves of the yellow abronia ornament the sand dunes of the coast from Eureka, California, northward to British Columbia. The flowers bloom in spring and summer, filling the air with the delightful fragrance of heliotrope.

Wild Four-O'Clock (*Mirabilis californica* Gray. Plate VI, figure 7).—On cool afternoons from March to June the pink or bright magenta blossoms of the four-o'clock add their beauty to the dry hillsides of southern California. By the next morning the slopes present quite a different appearance, for by this time the flowers have folded their gay banners and quietly gone to sleep.

The plants are low bushes, with brittle woody branches and sticky leaves, exhibiting quite a range of color that is consistent throughout. The paler pink flowers are accompanied by green leaves and stems, while the glowing magenta ones grow on reddish stems with dark green leaves and purplish involucres. There are often several buds inclosed by each involucre, but rarely is more than one at a time in full bloom.

A near relative that is very popular in California and southern climates as a porch climber is the Bougainvillea. The flowers are small and inconspicuous and it is the large bright red or magenta involucres that make the vines a mass of brilliant color.

BUCKWHEAT FAMILY

Polygonaceae

Wild Buckwheat (*Eriogonum fasciculatum* Benth. Plate VI, figure 8).—Whether adorning hillsides in spring with masses of feathery white bloom flushed with pink or turning the dry slopes of late summer to a rusty red, as the fruits ripen, the wild buckwheat is often the dominant note in the chaparral of southern California. In a somewhat dwarfed form (*Eriogonum polifolium*), it invades the Mohave Desert and clings to the mountain slopes of Death Valley and Nevada as part of the desert scrub.

Other members of the buckwheat family that deserve mention on account of their usefulness are the common rhubarb (*Rheum rhaponticum*) of the garden and the medicinal rhubarb (*Rheum officinale*). Not so useful, but much more beautiful, are princesplume (*Polygonum orientale*) of old-fashioned gardens, and its sister, the pink hearts-ease (*Polygonum pennsylvanicum*), in wet places the country over. Turkish rugging (*Chorizanthe staticoides*), which covers arid spots in southern and central California with a rough but rosy carpet in summer, is also a member of this family group.

HEATH FAMILY

Ericaceae

Bog Kalmia (*Kalmia polifolia* Wang. Plate VII, figure 1).—Where cold mountain streams rush noisily to add their waters to placid Alpine lakes, where June snow banks still linger in the shade of pine and spruce and high peaks tower dizzily, there is the favored haunt of the bog kalmia. One must step warily when in search of the rosy clusters of bowl-shaped blossoms, lest the boggy soil prove too moist for comfort or the foot slip from lake shore or brook bank into the water itself.

The bog kalmia is distinctly partial to coolness and moisture, choosing its abiding places in bogs of the North, from Newfoundland and Hudson Bay to Sitka, and entering the States along the ridges of the Rockies and Sierra Nevada, where mountain lakes and streams spread out into swampy areas. Two very near relatives occurring abundantly in the rocky woodlands of eastern North America are the lambkill (*Kalmia angustifolia*) and the mountain kalmia (*Kalmia latifolia*).

Yellow Heather (*Phyllodoce glanduliflora* Cov. Plate VII, figure 2).—The tiny yellow heather forms small evergreen patches on rocks and cliff edges in the mountains, hanging its clusters of sulphur-colored bells at the tips of short stems set with stiff leaves. It is an inconspicuous little dwarf, its quaint charm suggestive of the elves and pixies with whom the heather is traditionally associated.

Red Heather (*Phyllodoce empetriformis* Don. Plate VII, figure 3).—Our red heathers (*Phyllodoce empetriformis* and *P. breweri*) are very like, the former having somewhat smaller, nodding, bell-shaped flowers, found more especially on Mount Shasta, Rainier, and other more northern mountains, while the latter has larger, saucer-shaped blossoms that are sweet-scented and bloom in the high Sierra of California.

Blueberry (*Vaccinium caespitosum* Michx. Plate VII, figure 4).—Clinging closely to Mother Earth, the stems of the blueberry, closely set with bright green leaves, must be lifted, if one is to see clearly the little pink globes of spring flowers or the dusky blue berries of late summer. The plants rarely grow more than six inches tall, but may cover the ground thickly in mountain forests, or even higher up above the line where timber can grow at all. Though the berries are fairly large and sweet, the Sierra blueberry (*Vaccinium occidentale*) produces bigger and better ones on somewhat taller plants.

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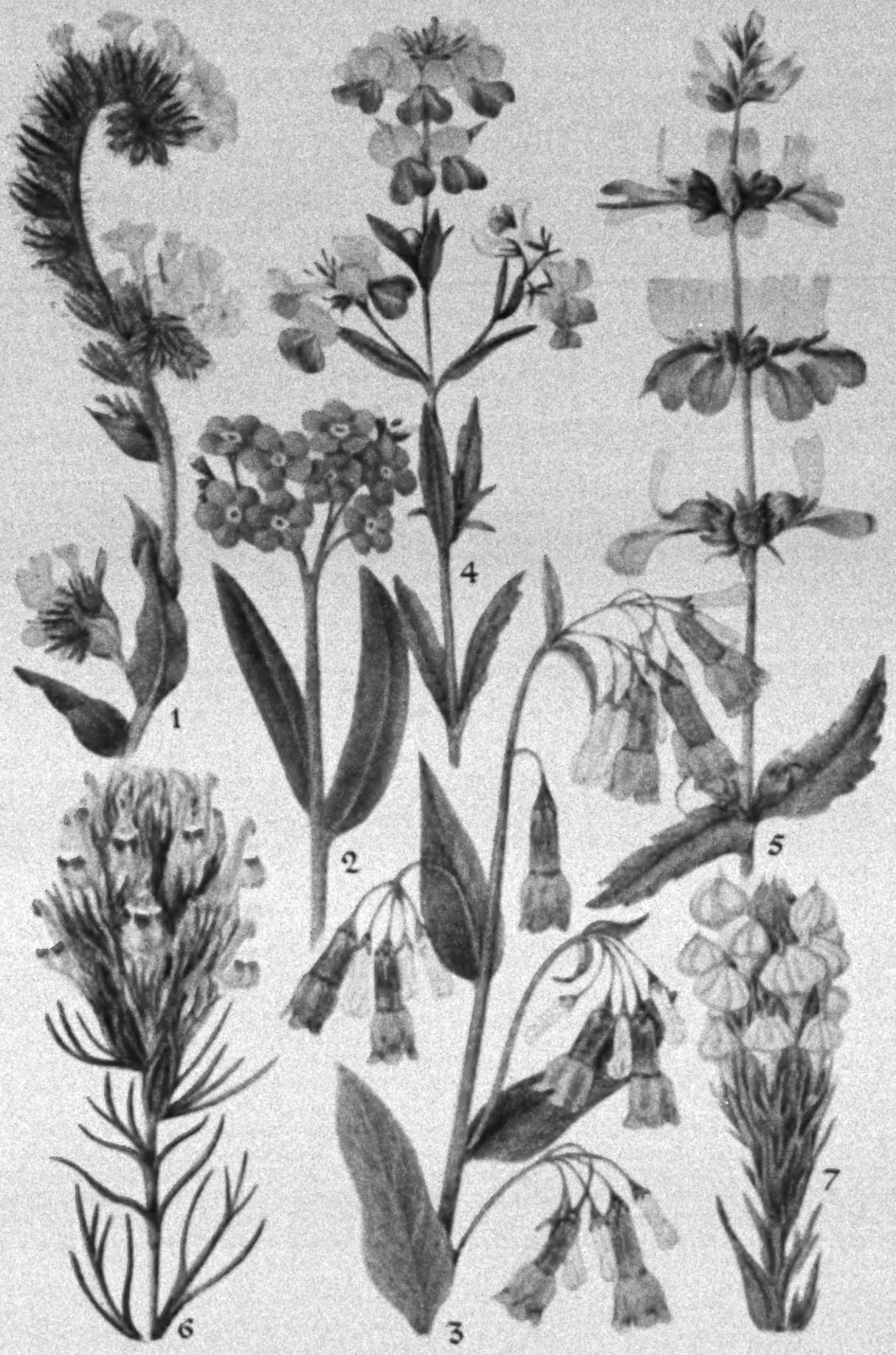
WATERLEAF FAMILY (*Hydrophyllaceae*): (1) Cup Phacelia, *Phacelia parryi* Torr.; (2) Bell Phacelia, *Phacelia whitlavia* Gray; (3) Tansy Phacelia, *Phacelia distans* Benth.; (4) Bee Phacelia, *Phacelia grandiflora* Gray; (5) Baby Blue-eyes, *Nemophila menziesi* H. & A.; (6) Climbing Nemophila, *Nemophila aurita* Lindl. MORNING-GLORY FAMILY (*Convolvulaceae*): (7) Bindweed, *Convolvulus arvensis* L.



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BORAGE FAMILY (*Boraginaceae*): (1) Fiddle-neck, *Amsinckia intermedia* F. & M.; (2) Forget-me-not, *Myosotis sylvatica* Hoffm.; (3) Mertensia, *Mertensia sibirica* Don. FIGWORT FAMILY (*Scrophulariaceae*): (4) Blue Collinsia, *Collinsia grandiflora* Dougl.; (5) Pink Collinsia, *Collinsia bicolor* Benth.; (6) Owl Flower, *Orthocarpus purpurascens* Benth.; (7) Cream Sacs, *Orthocarpus lithospermoides* Benth.

These are found in similar localities, but grow as high as two feet, and the berries may be a quarter of an inch across and almost black in appearance.

Box Blueberry (*Vaccinium ovatum* Pursh. Plate VII, figure 5).—This charming shrub of California coastal hills and redwood openings in western Oregon at all seasons is compelling in its beauty, whether bedecked with clusters of dainty pink blossoms in the spring and summer, hung with purplish black berries later in the season, or merely clothed in shining evergreen leaves. At Christmas time these branches are brought into the cities by the ton for household decoration. The berries are good to eat and make excellent preserves.

Manzanita (*Arctostaphylos tomentosa* [Pursh] Dougl. Plate VII, figure 6).—Of the many shrubs forming the chaparral of the coastal hills, none is better known or more characteristic than the manzanita. It lays a claim to distinction, not only for the beauty of its pale foliage and clusters of pink vaselike blossoms in combination with the red-brown of the branches, but also for the usefulness of flowers, wood, and berries. The blossoms yield an excellent brand of honey of fine flavor and light amber color. Perhaps the wood is not so useful as curious, after all; for, though the branches are hard and polished, shedding their thin, shreddy, cinnamon-colored bark every season, they are too crooked to be made into anything more practical than walking sticks. When green the berries are utilized for jelly and subacid beverages. On maturity the rosy fruits become dry and mealy and are eaten by the Indians either raw or cooked.

Another bearberry (*Arctostaphylos uva-ursi*) is widespread in almost all northern countries round the world, in many localities bearing the name kinnikinnic, given by the Indians. In the East it prefers sandy pine barrens and in the Middle West the sandy shores of lakes, where it forms dunelets.

Salal (*Gaultheria shallon* Pursh. Plate VII, figure 7).—Forming a fretted evergreen layer in redwood and fir forests as far north as Washington, the salal puts forth slender flowering stalks in the spring and early summer and hangs each with a row of drooping bells. As the season advances and the bees perform their appointed tasks, the blossoms give way to purple-black berries looking like small grapes and having a spicy smell and flavor.

Although the salal may boast of few close relatives, the wintergreen (*Gaultheria procumbens*) of eastern and northern low-growing evergreen woodlands gives the genus some claim to fame.

Western Azalea (*Rhododendron occidentale* Gray. Plate VII, figure 8).—For charm the western azalea ranks among the foremost, its fragrant white blossoms, faintly flushed with rose and ornamented with yellow, turning the margins of mountain streams into banks of beauty from early June to the end of July. Unforgettable memories of their loveliness are the rewards of visitors to the Yosemite or other resorts in the Sierra Nevada or Coast Ranges.

If one is desirous of shrubbery for any part of the lawn or garden, no mistake will be made in choosing any of the rhododendrons or azaleas for grouping or growing singly here and there. They are among the most beautiful and showy of flowering shrubs.

INDIANPIPE FAMILY

Monotropaceae

Snow Plant (*Sarcodes sanguinea* Torr. Plate VII, figure 9).—The vivid red shafts of the snow plant, thickly clustered with hanging bell-shaped flowers of glowing hue, shoot up like magic through the carpet of needles spread by the yellow pine during the winter. They are among the very earliest to pierce the dark soil, taking advantage of the abundant moisture left by melting snow banks. The plants are so striking by reason of their fiery translucence, to which no paint can do justice, that they were in a fair way to become exterminated until protected by man-made regulations, and even at the best to-day they occur only as scattered individuals and small colonies here and there in the Sierras.

The family group is very small and exclusive, and none is so gorgeous as the snow plant—the Indianpipe (*Monotropa uniflora*) being a creamy white and the pine-sap (*Hypopitys americana*) lemon-yellow.

WINTERGREEN FAMILY

Pyrolaceae

Pink Pyrola (*Pyrola rotundifolia* L. Plate VIII, figure 1).—Spicy spruce woods, rushing mountain brooks, and invigorating air mark the spots where the pink pyrola sends up single flower stalks hung with pendant coral blossoms. These are faintly fragrant, and the waxen petals, pale pink or tinged with shades deepening to carmine, cluster prettily about the pistil with its down-curving style. The leaves are as characteristic as the oddly shaped flowers and are found in a rosette at the base of the stem. They are quite round, with long stalks and scalloped edges, thick, leathery, and a shining dark green.

The pink pyrola grows in boreal and mountain habitats in Europe and Asia as well as in this country. Though not as abundant in California as the shinleaf (*Pyrola picta*) and the leafless pyrola (*Pyrola aphylla*), it occurs on Mount Rainier, around Lake Tahoe, and in the Yosemite.

Pale Pyrola (*Pyrola minor* L. Plate VIII, figure 2).—The creamy balls of the pale pyrola, flushed with pink, look like half-opened buds, even when in full bloom, and may be distinguished from the pink pyrola by paler tints, the short, straight style hidden within the petals, and the thin leaves. It is scarce in the Sierra Nevada, though present in the Yosemite, but is quite abundant in Oregon and farther north.

The green pyrola (*Pyrola secunda*) also has a straight style, but may be recognized by the

greenish flowers growing on one side of the stalk, while the other greenish white species (*Pyrola chlorantha*) looks more like the pink pyrola, as far as the style and arrangement of flowers are concerned.

All are lovers of cool northern and mountain woods throughout most of North America, Europe, and Asia.

PRIMROSE FAMILY

Primulaceae

Scarlet Pimpernel (*Anagallis arvensis* L. Plate VIII, figure 3).—In midmorning of clear days, the small coral-red blossoms of the scarlet pimpernel glow on their spreading mats of bright leaves like jewels against green silk. Although rarely more than two flowers on a leafy stem open at the same time, the plants may cover a considerable area and the mass of bloom forms one of the attractive features of fallow field or garden not too well tended. It is a cheery little weed that has come over from the Old World and is content with waste places everywhere, though preferring the coast to the warm interior.

Shootingstar (*Dodecatheon meadia* L. Plate VIII, figure 4).—Whether spread over hillsides as a rosy carpet for the advancing feet of spring, or occurring singly as heralds sent on before, the shootingstars are among the first to take advantage of winter rains or melted snows. They range from the Atlantic to the Pacific, from Michigan to Texas, from Lower California to Bering Strait; they are frequent in the Rockies, abundant in the Yosemite and Hetch Hetchy. For further details, see the National Geographic Society's publication, "The Book of Wild Flowers," page 198.

Starflower (*Trientalis europaea* L. Plate VIII, figure 5).—The pale sunshine that filters down through the overarching canopy of redwood tops is eagerly welcomed by the thin leaves of the starflower, as they stretch out in such a way as to receive the fullest benefit. Either unmixed or in company with the shade-loving oxalis, the tender green foliage forms over the sun-flecked ground a thick carpet adorned here and there by the dainty flowers so suggestive of seven-pointed stars.

Although dwellers in deep shade, this does not have the usual effect of an increase in height of the plant stem, and the starflower plants rarely grow more than the "third of a foot" tall, indicated by the name *trientalis*. Dimly lighted woods in Europe and Asia, as well as in the Coast Ranges from California to Alaska, shelter this species or its varieties, while the damp forests of the East are the home of a white-flowering species (*Trientalis americana*).

LEADWORT FAMILY

Plumbaginaceae

Sea-thrift (*Armeria vulgaris* Willd. Plate VIII, figure 6).—The sea-thrift, on sandy beach or grassy cliff, lifts cushionlike heads set with tiny lavender blossoms and overlooks the ocean from California to Alaska and from Labrador to Quebec. It loves the salt air and, thriving best in breezes from the sea, well deserves its name. The plants are easy to grow and the rosettes of narrow evergreen leaves at the base of the flower stalks are admirably adapted for borders in the garden or edgings along the walks.

GENTIAN FAMILY

Gentianaceae

Blue Gentian (*Gentiana calycosa* Griseb. Plate IX, figure 1).—Making an entrance on the scene long after the gay procession of spring bloomers have gone to seed and only the late summer laggards linger in sheltered places, the blue gentians hold the center of the stage in grassy mountain meadows.

The blue gentian of the Sierra Nevada in California and north to British Columbia is essentially the same as the blue gentian (*Gentiana parryi*) of the Cascades and Rocky Mountains. The sky-blue fringed gentian of the East (*Gentiana crinita*) is so eagerly sought as to be threatened with extermination, in spite of its success in attracting bumblebees and excluding harmful insects by means of the fringe. The fringed gentian of the Rockies (*Gentiana serrata*) is similar in shape, but a dark purple-blue in color.

The blue and fringed gentians have the habit of opening in the morning and closing in the afternoon, but their next of kin, the closed gentians, rarely or never open.

Rose Gentian (*Gentiana amarella* L. Plate IX, figure 2).—The rose gentian is more remarkable for its great diversity of habitat and variety of form than for intrinsic beauty or practical use. It is a cosmopolitan and may be welcomed as a friend from home by the traveler in Arctic America, Europe, and Asia, if he visit its favorite haunts in the mountains—whether the Rockies, Carpathians, or those that cluster thickly about the great deserts of Tibet and Mongolia. Having wandered far and wide over the face of the earth, it adjusts itself readily to changing conditions. In the deep shade of the spruce woods, it may become two feet tall and slender, stretching up toward the light, with broad, thin leaves adapted to making the most of the weak illumination. Exposed to the full strength of the sun, the plant may be scarcely half an inch high, but quite bunchy, many-flowered, and with thicker leaves. Such as strike root in the dry gravel slides or Alpine rock fields are unable to get enough food for full growth and remain the season through as tiny dwarfs—in extreme cases but half an inch tall, with one flower.

Erythraea (*Erythraea venusta* Gray. Plate IX, figure 3).—Few flowers can compete in brilliancy of color with the erythraea that covers the barer spots of dry hills and grassy mesas with masses of rose-purple blossoms. This striking tint explains the name, which means red. At their best, the plants grow a foot or more tall and quite branched, bearing such a profusion of bloom that each becomes a complete bouquet. A persistent search in spots with harder, drier soil will reveal tiny specimens an inch or so high, each with a single flower.

XUM

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FIGWORT FAMILY (*Scrophulariaceae*): (1) Golden Mimulus, *Mimulus luteus* L.; (2) Scarlet Mimulus, *Mimulus cardinalis* Dougl.; (3) Pink Mimulus, *Mimulus lewisi* Pursh; (4) Bush Mimulus, *Mimulus glutinosus* Wendl.; (5) Pedicularis, *Pedicularis ornithorhyncha* Benth.; (6) Scarlet Paintbrush, *Castilleja miniata* Dougl.

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FIGWORT FAMILY (*Scrophulariaceae*): (1) Clustered Pentstemon, *Pentstemon confertus* Dougl.; (2) Climbing Pentstemon, *Pentstemon cordifolius* Benth.; (3) Scarlet-bugler, *Pentstemon centranthifolius* Benth.; (4) Tinted Pentstemon, *Pentstemon heterophyllus* Lindl.; (5) Bushy Beardtongue, *Pentstemon antirrhinoides* Benth.; (6) Veronica, *Veronica americana* Schwein. BROOM-RAPE FAMILY (*Orobanchaceae*): (7) Cancer-root, *Orobanche fasciculata* Nutt.

The erythraea is very much of a stay-at-home, rarely venturing beyond the limits of central and southern California, though it does not object to climbing the mountains into the Yosemite and Hetch Hetchy valleys, taking up its home most willingly where there is bare sandy soil shaded by grasses or taller herbs and shrubs.

A near relative (*Sabbatia*) of the East and Southeast is often used as a substitute for quinine, an infusion being made from the dried leaves.

DOGBANE FAMILY

Apocynaceae

Dogbane (*Apocynum androsaemifolium* L. Plate IX, figure 4).—The low shrubs of the dogbane, with loose clusters of dainty pink and white blossoms hidden by dark green leaves, often form pretty borders to thickets in the East as well as the West. In some places in British Columbia the plants cover hundreds of acres; they are also very abundant along the Missouri River in Kansas and Missouri, where they are valued especially as honey-producers.

The milky juice of the dogbane, that blisters the skin and is somewhat used medicinally, has been found recently to yield as much as 5 per cent of good rubber.

MILKWEED FAMILY

Asclepiadaceae

Showy Milkweed (*Asclepias speciosa* Torr. Plate IX, figure 5).—One who wanders afield in late summer or autumn may find even greater pleasure in the harmony of browns, ochers, crimson, and gold than in the rainbow brilliance of spring and summer flowering. The dry grass on the hill slopes may shimmer in the sunshine like pale gold, and shrub and bush offer tints so rich and varied as to challenge even one insensitive to lesser glory. Asters and goldenrods claim the meadows, while along the streams brown cattails turn to fuzzy yellow and the pods of the milkweed hang dimmed by a mist of silver silk, as the tiny brown seeds forsake their satin-lined cradles to float lazily on the wind.

Early in the season the showy milkweed hangs heavy heads of purple blossoms on plants that seem frosted over, so thick are the fine white hairs covering leaf and stem. The buds of the cluster are shorter stemmed than the flowers and droop the lowest, rising and stretching up as they come into bloom.

Milkweeds are not at all pleasant to gather, as the stems exude generous quantities of a sticky, milk-white fluid that suggests the common name.

The desert milkweed (*Asclepias subulata*) excels in the amount of caoutchouc in its juice, which makes it the best of our native rubber plants. It is leafless for most of the year, consisting of a mass of rushlike stems often six to ten feet tall, and thrives in the Gila, Colorado, and Mohave deserts in an annual rainfall of one to three inches. The fiber has been found to be of excellent quality and can be made into fine writing paper.

PHLOX FAMILY

Polemoniaceae

Scarlet Gilia (*Gilia aggregata* Spreng. Plate X, figure 1).—The gilias are true Westerners, few of them ever venturing east of the Rockies and the majority keeping close to the Pacific coast. They take kindly to cultivation, and seeds may be sown freely wherever the plants are desired, as they will spring up readily and bear an abundance of blooms.

The scarlet gilia is a showy biennial that finds its native haunts on high sagebrush plains in the Middle West and warm mountain slopes at elevations of from six to ten thousand feet.

Globe Gilia (*Gilia capitata* Dougl. Plate X, figure 2).—The globe gilia is deservedly a favorite because of its dense round clusters of lavender-blue blossoms that nod from the tips of slender stems adorned with finely cut foliage. It springs up abundantly in open places and grasslands of the coast from California to Washington, but appears less readily further north. It is a remarkably fine garden plant, yielding a profusion of bloom and foliage in return for very little care.

Birdseye Gilia (*Gilia tricolor* Benth. Plate X, figure 3).—The birdseye gilia combines yellow in the tube of the flower with purplish brown spots at the base of lavender-blue petals in such a way as to resemble the varicolored eyes of certain birds. The blossoms are comparatively large and prettily clustered on graceful stems with finely cut foliage. They grow wild on hillsides of central California from coast to Sierra, but will thrive in the garden and bloom profusely with little care. White, rose-colored, or red-violet flowers are borne by cultural forms of the same species, and so complete a most charming color-range.

Buff Gilia (*Gilia grandiflora* Dougl. Plate X, figure 4).—The buds of the buff gilia are a pale yellow, the full-blown flowers a soft buff, turning to salmon-colored or pinkish as they fade. The blossoms are borne in showy terminal clusters on leafy stems and have long tubes with turned-back corolla lobes, similar to the scarlet gilia.

The plants thrive best in warm situations and take readily to openings in the mountains and foothills up to 6,000 feet, being quite common in the Yosemite and thereabouts. They may be found also in similar spots as far north as British Columbia and east to Idaho and Nevada and are also much cultivated in Germany.

Prickly Gilia (*Gilia californica* Benth. Plate X, figure 5).—Most beautiful of all the gilia group, the prickly gilia sharply resents being ruthlessly gathered, and is so surrounded by spiny foliage that it scarcely needs protection. Its chosen haunts are amid the chaparral from Los Angeles to Monterey, and its lovely rose-pink blossoms, smothering low shrubs with satiny petals, are worth going far to see. They are fragrant, too, and, though not hardy in the East, are adapted to sunny spots and rock nooks in mild climates.

Feather Gilia (*Gilia androsacea* Benth. Plate X, figure 6).—The dainty little feather gilia blooms unobtrusively among the grasses or shrubs in the lower altitudes of the Sierra Nevada and Coast Ranges. The long-tubed, lavender-blue flowers on threadlike pedicels form loose clusters from a whorl of linear leaves, and unless growing densely enough to form beds, may pass unnoticed among their companions of spring—poppies, creamcups, and baerias.

Fringed Gilia (*Gilia dianthoides* Endl. Plate X, figure 7).—Dainty as Dresden china shepherdesses, the delicate pink and white blossoms of the fringed gilia cover the bare spots of grassy mesas with exquisite springtime bloom. One would not expect so lovely a flower to be a hardy pioneer, but the low, spreading plants with threadlike ground stems and dark green leaves are at their best where there are no competitors for the means of existence.

On the other hand, if these become too meager, where the soil is hard and dry instead of sandy, the flowers are pale and dwarfed, perhaps but three-eighths of an inch in diameter on stems half an inch high, and only one blossom to a plant.

Under favorable conditions, a single plant may cover an area five or six inches in diameter and bear a dozen blossoms three-quarters of an inch across. It is in the morning only that the fringed petals open wide.

Yellow Gilia (*Gilia aurea* Nutt. Plate X, figure 8).—The yellow gilia companions its near relative, the fringed gilia, in California, but ventures to travel as far eastward as Arizona and New Mexico. It is a tiny little plant, with branching, threadlike stems, tipped with flowers of an interesting variation of color, and with a tube more slender than a pin. Though usually some shade of yellow, forms occur that bear flowers white or cream-colored.

Mountain Phlox (*Phlox douglasi* Hook. Plate XI, figure 1).—This pretty little phlox spends the summer days in cool mountain air, busily creeping over gravelly soils and covering its stems with innumerable needle-shaped leaves and masses of rose-purple flowers. The narrow leaves are very like those of its cousin, the fringed gilia, but if one is curious enough to wonder why the one is a gilia and the other a phlox, the answer is to be found in the open throat of the former and the slight constriction in the tube of the latter.

Like the gilias, phloxes are one hundred per cent American, but instead of being limited to the West, they have wandered far and wide over the northern continent, from the Atlantic to the Pacific and from Mexico to Canada. They have also won their way into general garden culture, often known as sweet Williams, and many have attracted the attention of gardeners abroad. It is the gorgeous coloring of some of the earliest known kinds that has given the name of phlox, or flame, to all.

Alpine Polemonium (*Polemonium confertum* Gray. Plate XI, figure 2).—Well-seasoned must be the mountain climber who would glimpse the Alpine polemonium in its rocky seclusion. Far beyond timber line on the summits of the high Sierras and Rocky Mountains, sheltered from wind and sun by granite bowlders, these heavenly blue blossoms spread their fragrance on the clear, cold air.

Like their relatives, the phloxes and gilias, the polemoniums are decidedly partial to America, especially the western slope. The resemblance of these three is close, but one soon comes to recognize the family features.

The plant illustrated is the shade form found in rock clefts on the highest peaks. It is sometimes regarded as a distinct species (*Polemonium speciosum*).

Dwarf Polemonium (*Polemonium humile* Willd. Plate XI, figure 3).—The dwarf polemonium shuns the solitudes of Alpine heights, content to make its home in flowery meadows several thousand feet below its more ambitious sister. Seeking the moist shade of spruce and fir, it often covers the ground with prettily cut leaves and low stems, which produce pale blue or white flowers in graceful clusters toward the tip. Anyone who has seen the creeping polemonium (*Polemonium reptans*) of open woods in the East will quickly recognize the two as being closely related.

POTATO FAMILY

Solanaceae

Blue Nightshade (*Solanum umbelliferum* Esch. Plate XI, figure 4).—Claiming kinship on the one hand with some of the best known fruits and vegetables, and on the other with valuable drugs and dangerous poisons, the blue nightshade avoids being either useful or harmful, but succeeds in pleasing the eye.

The shallow corollas pointed and ruffled where the petals join, are sometimes a pale lavender-blue and again a dark purple, ornamented in each case with white-edged green spots at the base of the yellow cone of stamens.

The color scheme is charming in the spring and summer, when the loose clusters of buds and full-blown or half-opened flowers adorn the bushy plants, and again in late summer, when these are replaced by bright green or purple berries.

Although partial to the Golden State, the blue nightshade may send a nearly related form across the line into Nevada.

More than one *Solanum* is a veritable Dr. Jekyll and Mr. Hyde—trustworthy at one time, but malicious at another. The black nightshade (*Solanum nigrum*), which grows all over the world in damp or shady places, but especially in cultivated and waste ground around towns, belongs to this treacherous group. It has small white flowers and black berries. Since these are frequently used in pies and preserves, care should be taken to see that they are thoroughly ripe and well cooked, for they are poisonous when green. Cooking seems to dissipate the poison in the leaves, also, for they produce no ill effects when used as a potherb.

Under cultivation, the black nightshade pro-

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MINT FAMILY (*Menthaceae*): (1) Wood Mint, *Stachys bullata* Benth.; (2) Monardella, *Monardella villosa* Benth.; (3) Skull-cap, *Scutellaria angustifolia* Pursh; (4) Prunella, *Prunella vulgaris* L.; (5) Romero, *Trichostema lanatum* Benth.; (6) Thistle Sage, *Salvia carduacea* Benth.

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ROSE FAMILY (*Rosaceae*): (1) Yellow Avens, *Geum macrophyllum* Willd.; (2) Pinkplumes, *Geum triflorum* Pursh; (3) Potentilla, *Potentilla gracilis* Dougl.; (4) Shrubby Cinquefoil, *Potentilla fruticosa* L.; (5) Spiraea, *Spiraea densiflora* Nutt.; (6) Wild Rose, *Rosa californica* C. & S.

duces unusually large and handsome berries that have given it considerable prestige under the name of wonder-berry.

Far less attractive in appearance, the green berries of the common potato (*Solanum tuberosum*) have, nevertheless, been eaten, and with fatal results. It is something of a shock to find that the friendly potato tuber itself is apt to be poisonous when it shows a green or purplish green color in the skin or black fungus spots within, as well as when actively sprouting.

Among other contributions to the dinner table made by the potato family mention should be made of the eggplant (*Solanum melongena*) and the tomato (*Lycopersicum esculentum*). It may seem strange to an American, who esteems the tomato so highly, to learn that, although used in ancient times, it was long viewed with suspicion and is still considered poisonous in certain localities.

The potatoes may claim the morning-glories and the waterleafs as next of kin. They differ from the former in having many-seeded in place of few-seeded fruits, and from the latter in having the fruit divided into two cells.

Tree Tobacco (*Nicotiana glauca* Graham. Plate XI, figure 5).—More than 30 years ago a floral resident of South America traveled north and settled down in the Golden State, and to-day the tree tobacco is as much at home in southern California as any native son. From year to year it stakes out claims to more territory, but these do not often conflict with prior real-estate rights, since it is from ditches, roadsides, and waste places that the tall, spreading branches, with silvery leaves and trumpet-flowers of dull yellow and green, make graceful curtsies from January to June.

WATERLEAF FAMILY

Hydrophyllaceae

Whispering Bells (*Emmenanthe penduliflora* Benth. Plate XI, figure 6).—The buds of whispering bells open in the springtime, drooping from an erect position as the bell-like corollas expand and hanging on such slender stalks as to shake readily in the wind. Later in the season the petals become dry and papery, and then, as the breeze wanders over the slopes and stirs the pendant creamy blossoms as it passes, there may be heard a rustling sound, faint and mysterious, like hushed whisperings. In this condition the flowers are employed as everlastings in floral decorations.

The plants may be single-stemmed and but a few inches tall in dry situations, or much branched and two feet or more high when there is sufficient moisture; they are found frequently on the dry open slopes of central and southern California, especially where the chaparral has recently been burned.

Yerba Santa (*Eriodictyon tomentosum* Benth. Plate XI, figure 7).—Lovely lilac blossoms and soft gray foliage blend harmoniously on the shrubs of yerba santa and lend a distinctive note to the coastal hills of southern California. The early Spanish settlers were more interested in the medicinal virtues of the plant than in its appearance, and their name of holy herb bears witness to the esteem in which it was held. This was applied originally to the more northern species (*Eriodictyon californicum*), which occurs on the dry hills and lower mountain slopes from central California to Washington.

The shiny green leaves are aromatic and bitter and have been much used for colds and similar ills, either as a syrup or steeped in spirits. The Indians have long been accustomed to brew them into a tea for use in fever and to smoke and chew them as a sort of tobacco.

Cup Phacelia (*Phacelia parryi* Torr. Plate XII, figure 1).—The royal purple blossoms of the cup phacelia add their rich tints to the spring verdure of southern California, often covering open places in the chaparral with unbroken masses of color. The flowers are shallower than those of the bell phacelia, which wears the same tint, and each petal is ornamented with a cream-colored spot at the base.

The reddish stems are branching, hairy, and rather sticky, growing to a height of a foot or so, and the leaves are dark green and also hairy.

Bell Phacelia (*Phacelia whitlavia* Gray. Plate XII, figure 2).—The bell phacelia spreads an unbroken carpet of royal hue over openings in the chaparral of southern California, where the spring moisture still lingers, or adorns partly shaded foothill canyons with lovely blossoms until advancing summer suggests that seedtime is near.

Tansy Phacelia (*Phacelia distans* Benth. Plate XII, figure 3).—Day by day the close coils of the tansy phacelia slowly unfurl until there is spread a tint of lavender-blue over coastal hill and mesa. On the shore, where there is plenty of room and moisture, the plants branch freely, forming low growths a foot or more in diameter, while the usual grassland form may be two feet tall and the tiny, starved drought form able to produce but one slender stem two inches in length, tipped by a single small group of blossoms. The entire plant is covered with fine hairs, in addition to enough stiff ones to make it rough to the touch.

Bee Phacelia (*Phacelia grandiflora* Gray. Plate XII, figure 4).—Burned-over spots in the chaparral belt of southern California are not long allowed to mar the landscape with blackened ruins, for the bee phacelia promptly takes possession, sending up its stout-branched stems to a height of four feet or more.

From April to May the buds at the ends of the coiled inflorescences turn from green to white, and, deepening in tint as they unfold, are finally transformed into saucer-shaped blossoms an inch or two in diameter, pale blue-lavender to deep rose-lavender in hue.

In the height of the season the tall plants, ornamented with handsome clusters of showy, fragrant blossoms, are queens of beauty, attracting attention from afar with masses of bloom.

Baby Blue-eyes (*Nemophila menziesi* H. & A. Plate XII, figure 5).—Reflecting the color

of the sunlit heavens, the baby blue-eyes stare up at one from grassy meadows, or peep out from the edges of chaparral and woodland, where moisture and partial shade protect their delicate stems and leaves from drought. Lovely as these ethereal blossoms are in their native haunts, they close soon after being picked, and so should be left where they grow or introduced into the garden at home, for they take readily to cultivation.

Baby blue-eyes may be looked for throughout California and north to Oregon.

Climbing Nemophila (*Nemophila aurita* Lindl. Plate XII, figure 6).—The climbing nemophila aspires to greater heights than its sister, baby blue-eyes. Catching hold of near-by shrub and bush by means of many little hooks on stem and leaf, it clambers over them, mingling its own bright green foliage with theirs and adorning them with velvety flowers. These wide-eyed, innocent-looking blossoms are so appealing that one may be tempted to put out an unwary hand to grasp a cluster, only to drop it with an exclamation of dismay, for the down-curving hooks on the square stems dig sharply into flesh like the claws of an angry cat.

The climbing nemophila, true to its name of grove-loving, haunts shady dells and canyons throughout central and southern California.

MORNING-GLORY FAMILY

Convolvulaceae

Bindweed (*Convolvulus arvensis* L. Plate XII, figure 7).—Judged solely by external appearance, the bindweed is a sight to gladden the eye, as its close mats of pretty, arrow-shaped leaves riot over roadways, ditch banks, and fields, decking themselves in late summer with a profusion of exquisite blossoms—creamy white, pale rose, or blushing pink. They are extremely satisfactory as house bouquets, as the leaves keep fresh a long time and the buds continue to open over a considerable period. For further details, see the National Geographic Society's publication, "The Book of Wild Flowers," page 160.

Nearly related to the bindweeds are the sweet-potato (*Ipomoea batatas*), which bears purple blossoms very like those of the morning-glory, and the dodder (*Cuscuta*), with inconspicuous flowers. The former occupies a seat of honor as a valuable food plant, while the latter is an outcast, a thief and a robber, that smothers near-by plants with tangled skeins of yellow threads shining in the sunlight like spun silk.

BORAGE FAMILY

Boraginaceae

Fiddle-neck (*Amsinckia intermedia* F. & M. Plate XIII, figure 1).—Of the coast borages, fiddle-neck is one of the prettiest, although when massed the bristly, rough herbage and the dropping of the bright orange corollas, as the seeds mature, give a ragged effect to the whole. The individual blossoms are attractive in color and shape and interestingly arranged into a closely coiled inflorescence, something like that of the phacelias, that uncoils as the flowers open successively along its axis.

The popcorn-flower (*Plagiobothrys nothofulvus*) is a closely related species that springs up abundantly in burned areas along the coast from southern California to Washington. So freely do the plants blossom after a fire that the crowded whiteness was likened to snowflakes by the Spaniards, though to a more practical imagination it resembles popcorn.

Forget-me-not (*Myosotis sylvatica* Hoffm. Plate XIII, figure 2).—The forget-me-not is a charming little foreigner that has been brought over from Europe and placed under cultivation in this country. Whether massed in the garden or running wild through the redwood forest, the heavenly blue blossoms stand without a rival in sheer loveliness of color and delicacy of fragrance. Tiny yellow spots at the opening of the corolla not only enhance the beauty of the flower, but serve also to guide the bee to the nectar within.

The forget-me-not of the East (*Myosotis palustris*) looks very like its sister in the West. It also is a native of Europe, as is the turncoat forget-me-not (*Myosotis versicolor*), with flowers that change from yellow to blue and then to violet in the course of their development.

In contrast to some flowers whose names are legion, the forget-me-not is called such in many languages.

For centuries this flower has been regarded as the emblem of eternal friendship and love and many a ring bears it in designs. In the fourteenth century the forget-me-not motif was woven into the collars worn by the knights of chivalry, especially those who were faithful to Henry of Lancaster in his exile.

Mertensia (*Mertensia sibirica* Don. Plate XIII, figure 3).—Where mountain brooks rush noisily down rocky slopes or loiter lazily through grassy meadows, the mertensia hangs out carillons of bell-shaped blossoms—the buds flushing rosily, the full-blown flowers serenely blue. The plants may grow as tall as four or five feet, the long, leafy stems arching in graceful curves where the flowers are clustered. Unlike the typical borages, which are usually bristly, both stem and leaf are soft and smooth to the touch.

Wherever mertensias grow, whether in the Rocky Mountains of Colorado, the higher Sierras of California, or far northward, there is a scene of busy and varied activity, as bees and wasps, bumblebees and humming birds, stop for sips of nectar or loads of pollen and fly away again.

FIGWORT FAMILY

Scrophulariaceae

Blue Collinsia (*Collinsia grandiflora* Dougl. Plate XIII, figure 4).—The blue collinsia wears an air of ethereal loveliness when massed on shady slopes, the lavender and blue of the two-toned corollas producing an unusual color effect, especially if supplemented by the pink of the rose-colored variety, which may grow here and there in the mass of bloom. Although this

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PEA FAMILY (*Fabaceae*): (1) Crimson Sweetpea, *Lathyrus splendens* Kell.; (2) Pale Sweetpea, *Lathyrus vestitus* Nutt.; (3) Meadow Lotus, *Lotus oblongifolius* (Benth.) Greene; (4) Velvet Lotus, *Lotus americanus* (Nutt.) Bisch.; (5) Hairy Lotus, *Lotus strigosus* (Nutt.) Greene; (6) Bush Lotus, *Lotus glaber* (Torr.) Greene; (7) Chaparral Pea, *Pickeringia montana* Nutt.; (8) Alfalfa, *Medicago sativa* L.

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PEA FAMILY (*Fabaceae*): (1) Harlequin, *Lupinus stiversi* Kell.; (2) Bluebonnet, *Lupinus affinis* Agardh.; (3) Dwarf Lupine, *Lupinus nanus* Dougl.; (4) Beach Lupine, *Lupinus chamissonis* Esch.; (5) Yellow Lupine, *Lupinus arboreus* Sims; (6) Vetch, *Vicia americana* Muhl.; (7) Scarlet Loco, *Astragalus coccineus* Brand.

species occurs naturally along the coast from northern California to British Columbia, it is easily grown in the garden elsewhere, blooming early in the spring if the seeds are sown in the fall.

Pink Collinsia (*Collinsia bicolor* Benth. Plate XIII, figure 5).—Whether covering shaded banks with tier upon tier of delicately tinted blossoms or adorning open places with masses of rose-lavender and white, the pink collinsia is one of the loveliest of spring bloomers. The flowers are arranged in crowded circles at intervals about the stem, suggesting the successively flaring roof lines of Chinese pagodas and the name of Chinese houses, often used. The plants are usually unbranched in the shade, but when growing in open, sunny spots they are apt to be more robust and branching, the flowers taking on deeper shades of rose-purple in the lower lip and pale lavender in the upper.

Moist situations in the hills and lower mountains of western California may be masses of these charming blossoms in April and May.

Owl Flower (*Orthocarpus purpurascens* Benth. Plate XIII, figure 6).—Massed in open spaces or scattered through the grasses of the foothills, the owl flowers form sheets of rose-purple or supply individual touches of color. Not only are the blossoms gay with magenta, yellow, and white, but the leafy bracts that help form the flowering heads are crimson or purple-tipped.

The curving shape of the upper lip of the corolla and the markings of white and yellow on the lower may readily be likened to an owl's hooked beak and unblinking eyes. Since this plant has no relationship to the clovers, its usual name of owl clover is misleading.

Cream Sacs (*Orthocarpus lithospermoides* Benth. Plate XIII, figure 7).—Cream sacs is next of kin to the owl flower. Both are loyal Californians, the latter preferring the southern part of the State, while the former ventures farther north. The blossoms are bright yellow, the very much inflated lower lip forming a pouch that suggests the name commonly used. A paler yellow companion (*Orthocarpus erianthus*) trims its sulphur-colored flowers with white and purple and is thus easily distinguished.

Golden Mimulus (*Mimulus luteus* L. Plate XIV, figure 1).—The slender creeping stems of the golden mimulus enable it to spread widely in dry places during the spring and to continue to bloom profusely far into the drought of summer. From California to Alaska and east to the Rockies, the cheery yellow blossoms, freckled with maroon spots, grin impishly up at one, as once did the mimics of the Roman stage for whom they were named. The less attractive name of monkey-flower is likewise based on this grimace, and children love to pinch the throat and watch the mouth open, apparently in hilarious laughter, and to touch the sensitive stigmas with pencil or finger tip, fascinated by their prompt closing together under the impact.

Scarlet Mimulus (*Mimulus cardinalis* Dougl. Plate XIV, figure 2).—The petals of certain poppies are like crinkled crêpe, and of others lustrous satin. Everlastings take on a durable texture like stiff paper, while pansies and the scarlet mimulus clothe themselves in velvet. The rich, warm red of these corollas blends to yellow in the throat, which is marked with crimson guide lines. The turning backward of the lobes makes all the more evident the unusual length of the stamens, so well adapted to depositing pollen on humming-bird visitors.

Swampy places and streamways in California and Oregon and as far east as Arizona may be made gay with the bright flowers adorning dark green plants.

Pink Mimulus (*Mimulus lewisi* Pursh. Plate XIV, figure 3).—In moist mountain meadows the pink mimulus is to be sought. The blossoms are large and showy, rose-pink with yellow throats, and borne in pairs on slender stalks. The plants are perennial and may be found as far north as the Selkirks, along the entire length of the Sierra Nevada, and as far east as Montana and Utah.

Bush Mimulus (*Mimulus glutinosus* Wendl. Plate XIV, figure 4).—Mingling with the chaparral or forming evergreen thickets on rocky banks, the bush monkey-flowers are among the most characteristic features of the coast vegetation of southern and middle California. They are exceedingly variable in both flower and foliage. The more southern form, common on dry hillsides around San Diego, is distinguished by glossy dark green leaves and dark crimson flowers of a velvety texture. Northward the blossoms are larger and pale buff in color, the foliage also being correspondingly lighter green. Between these two extremes many gradations in color and tint occur, such as salmon, orange, vermilion, and rich red.

Pedicularis (*Pedicularis ornithorhyncha* Benth. Plate XIV, figure 5).—The dark, rose-purple clusters of oddly shaped pedicularis blossoms form fascinating groups in boggy mountain meadows in Washington and Oregon, but especially on Mount Rainier. The plants rarely grow more than six inches tall, the purplish stems springing from a basal cluster of deeply cut leaves and bearing flowers in a compact head at the tip.

Scarlet Paintbrush (*Castilleja miniata* Dougl. Plate XIV, figure 6).—Where the chaparral is low and open, spots of scarlet-vermilion flash vividly against the dark green of buckwheat, sage, and sumac, as the scarlet paintbrush adorns its leafy stems with bloom. Not a small part of the bright color is due to the bracts and calyxes, which rival the corollas in hue. *Castilleja* is always found close to the shrubs upon which it is partly dependent, although quite able to take care of itself entirely by means of its own root system and green, food-making leaves, if other sources fail.

Castillejas are well named paintbrushes, since the various species include a complete palette

in their range of color, only the blues being lacking.

They are mostly mountain lovers, this scarlet one being found from the foothills almost to timber line, growing from southern California to Alaska and throughout the Rockies. Several species of *Castilleja* occur in the Rocky Mountains; a cream-colored one (*Castilleja sessiliflora*) is common on the prairies, and the Indian paintbrush (*Castilleja coccinea*) often turns eastern swamps into flame.

Clustered Pentstemon (*Pentstemon confertus* Dougl. Plate XV, figure 1).—Cerulean blue masses of the clustered pentstemon may be glimpsed from afar, as they cover mountain slope or meadow in the northern Rockies or the Sierra Nevada. On nearer view the stems are seen to be straight and unbranched, with the flowers arranged in crowded circles or whorls, of which the taller-growing individuals in the shade may boast several, while the dwarfs of dry soil or high altitudes are able to produce but one at the tip.

In certain regions the blossoms are creamy white or pale yellow, but they may still be recognized by their characteristic grouping.

Pentstemons are even more abundant and gorgeous in the Rocky Mountains, and two very beautiful ones are frequent on the prairies of the Middle West. One of these, the shell-leaf pentstemon (*Pentstemon grandiflorus*), is sometimes six to eight feet tall and bears lavender flowers two inches long; the cobaea pentstemon (*Pentstemon cobaea*) is shorter, but possesses flowers nearly as large and attractive.

Climbing Pentstemon (*Pentstemon cordifolius* Benth. Plate XV, figure 2).—Pentstemons that climb are rare, and when to this habit are added flowers of vermilion hue, so unusual for this genus, there is a twofold claim to distinction. Passing through the chaparral belt of southern California in early summer, one often sees masses of bright red blossoms borne apparently on all sorts of shrubs. At first sight they seem to belong to honeysuckle vines clambering on whatever support is at hand, but closer inspection reveals the sterile filament in the throat of the flower that identifies it as a pentstemon.

Scarlet-bugler (*Pentstemon centranthifolius* Benth. Plate XV, figure 3).—The scarlet-bugler catches even the fleeting glance by its shafts of color glowing against a dark background of chaparral. The stiff, straight stems bear smooth gray-green leaves and long spikes of drooping red blossoms. The tubes are so long and narrow that many bees are barred from access to the nectar at the base. Humming birds are quite able to reach it.

The scarlet-bugler of the Rockies (*Pentstemon barbatus*), which is closely akin to the species of the foothills, enjoys the distinction of being already under cultivation.

Tinted Pentstemon (*Pentstemon heterophyllus* Lindl. Plate XV, figure 4).—As the buds of the tinted pentstemon burst into bloom, they turn gradually from a pale yellow to showy blossoms with inflated rose-purple tubes and turned-back lobes of deep purple-blue. This species favors dry hillsides of the chaparral belt of southern California and the Coast Ranges, while the azure pentstemon (*Pentstemon azureus*) may be found in similar situations farther north. A blue species (*P. lactus*), often mistaken for the tinted pentstemon, finds its home in the Sierra Nevada, while still another (*Pentstemon spectabilis*), forms huge clumps of leafy stems five or six feet tall which bear long spikes of handsome purple-blue blossoms.

The eastern foxglove (*Digitalis purpurea*), grown for the sake of its beautiful large purple flowers, as well as for the important drug furnished by its leaves, is a near relative of the pentstemons.

Bushy Beardtongue (*Pentstemon antirrhinoides* Benth. Plate XV, figure 5).—Whether cultivated in the garden or growing wild on warm hillsides of southern California, the bushy beardtongue is a beautiful shrub, well adapted for decorative purposes. The spreading, leafy branches, dotted with bright yellow, oddly shaped blossoms, make charming festoons that give a distinctive note to the coastal sagebrush.

The unusually wide and gaping throats of the flowers afford a clear view of the sterile fifth stamen, present in members of the group, but in this case it is thickly bearded with short hairs.

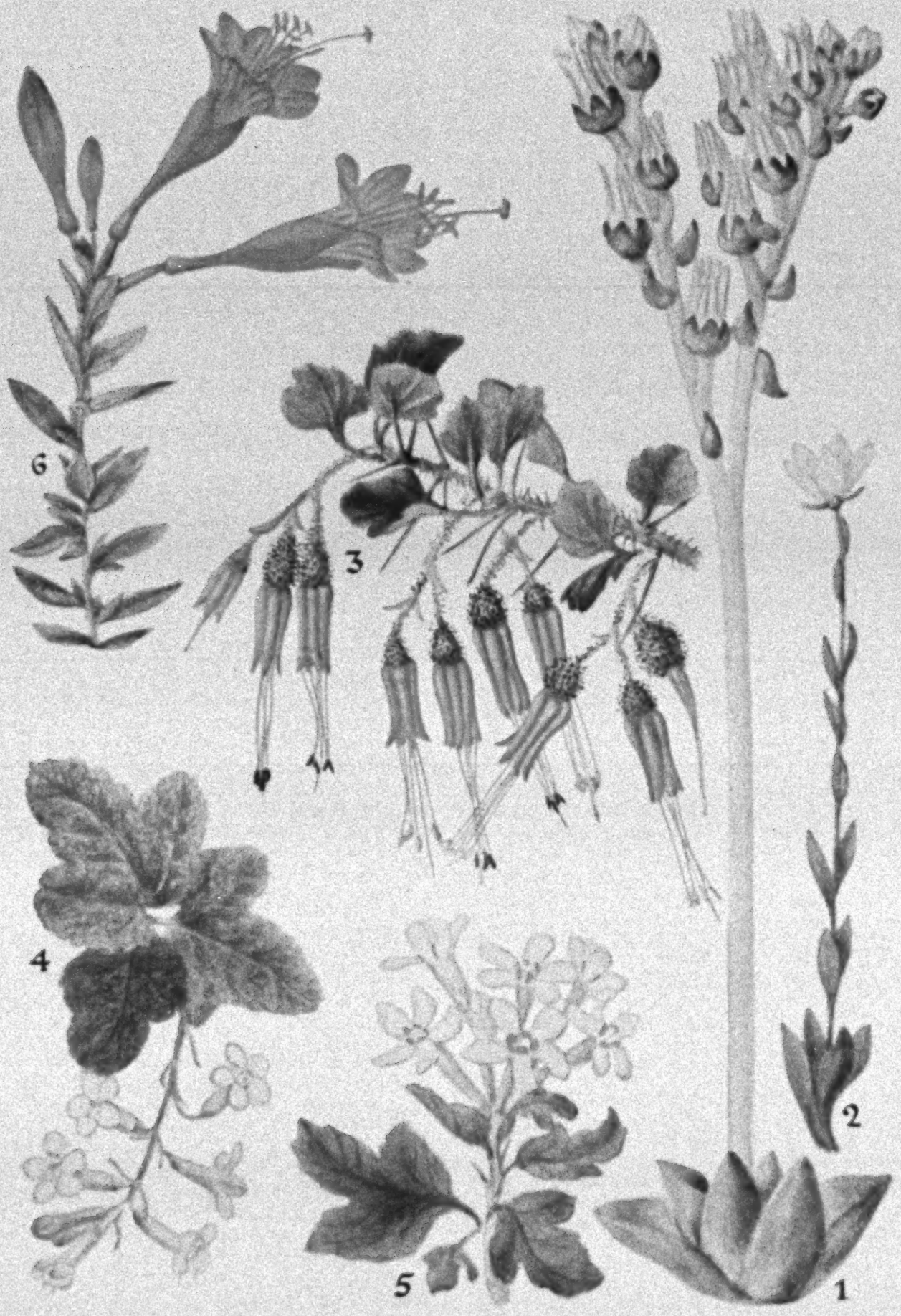
Veronica (*Veronica americana* Schwein. Plate XV, figure 6).—Many a slow-moving streamlet or meadow with wet soil offers a home for the little creeping veronicas, with their smooth leaves and loose, spreading clusters of two-toned blue blossoms. These are small circles of pale blue, so striped with darker lines radiating from the center as to suggest the iris of an eye. They are actually called cat's eyes in some parts of England.

The moth mullein (*Verbascum blattaria*) is a close relative of the veronica, though one would never guess it from a superficial glance. The great mullein (*Verbascum thapsus*), even more stately, its impressive height of 10 or 12 feet earning it the title of Jupiter's staff, is also a cousin.

BROOM-RAPE FAMILY

Orobanchaceae

Cancer-root (*Orobanche fasciculata* Nutt. Plate XV, figure 7).—The dull yellow, clustered stems of the cancer-root, hung with ocher-colored blossoms, are neither abundant nor beautiful enough to attract the attention at first, but, once noticed, their unusual appearance arouses immediate interest. A total lack of green color introduces them as members of the "I Won't Work" family of the plant world. Near-by sage and buckwheat or other shrubs furnish sufficient foodstuff in their roots to permit the support of hangers-on, such as these pale beggars attached to them. Some species are especially fond of such valuable forage plants as alfalfa and clover, which often succumb to the drain made upon them by the parasite. Hemp, maize, tobacco, and other agricultural crops do not escape



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ORPINE FAMILY (*Crassulaceae*): (1) Live-forever, *Cotyledon pulverulenta* B. & H. SAXIFRAGE FAMILY (*Saxifragaceae*): (2) Yellow Saxifrage, *Saxifraga hirculus* L. GOOSEBERRY FAMILY (*Grossulariaceae*): (3) Garnet Gooseberry, *Ribes speciosum* Pursh; (4) Flowering Currant, *Ribes sanguineum malvaceum* Loud.; (5) Golden Currant, *Ribes aureum* Pursh. EVENING-PRIMROSE FAMILY (*Onagraceae*): (6) Hummingbird-trumpet, *Zauschneria californica* Presl.

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EVENING-PRIMROSE FAMILY (*Onagraceae*): (1) Fireweed, *Epilobium angustifolium* L.; (2) Godetia, *Godetia quadrivulnera* Dougl.; (3) Farewell-to-spring, *Godetia amoena* Lilja; (4) Fringed Clarkia, *Clarkia concinna* (F. & M.) Greene; (5) Tall Clarkia, *Clarkia elegans* Dougl.; (6) Sun-cups, *Oenothera bistorta* Nutt.

serious damage, once the particular kind of cancer-root partial to them begins to feed upon them.

MINT FAMILY

Menthaceae

Wood Mint (*Stachys bullata* Benth. Plate XVI, figure 1).—The bright flowers of the wood mint charm the discerning eye, as they cluster about the stem like tiny moths or butterflies with rosy heads and gaily speckled wings. The slender plants stand straight and stiff, like small troops of toy soldiers, at the edges of copse and woodland—sentinels guarding the entrance to realms of fancy. The soft, wrinkled leaves give forth a spicy fragrance when bruised. They are covered with hairs that sting feebly, somewhat as a nettle does, so that the species is often wrongly called hedge-nettle.

Among the many near relatives of the wood mint, hoarhound (*Marrubium vulgare*) should be mentioned because of its abundance. It is another European immigrant which has escaped from gardens in this country and spread everywhere, taking such complete possession of waste places and pastures as to crowd out all other vegetation and ruin the land for its original purpose. Although considered a most troublesome weed in many parts of California and Oregon, it furnishes one of the chief sources of nectar in the Arkansas Valley in Kansas and portions of Texas.

Monardella (*Monardella villosa* Benth. Plate XVI, figure 2).—The stiffish stems of monardella, bearing round, headlike clusters of rose-purple flowers, are partial to the coastal slopes of California, in the shade of thickets or in open places near the sea.

Although monardellas are loyal Californians, they are so like the monardas of the East as to be easily recognized as close relatives. The horsemint (*Monarda punctata*) occupies sandy ground from New York to Wisconsin and south to Florida and Texas. It has pale, spotted flowers and yields an oil useful in medicine, as well as a clear, amber honey. Another horsemint (*Monarda fistulosa*) is even more widely distributed, flourishing in meadow and thicket from Canada southward to Florida and Arizona, while the beebalm (*Monarda didyma*), with its brilliant scarlet flowers, is restricted to the East proper.

Skull-cap (*Scutellaria angustifolia* Pursh. Plate XVI, figure 3).—The purple-blue flowers of the skull-cap rise jauntily erect, two by two, the expanded lower lobes of the corolla and the upper hooded lip at the end of the slender upright tube suggesting images of some odd little bird or fish about to fly. The paler tubes narrow toward the base, where queer reddish calyxes, shaped more like sunbonnets than skull-caps, inclose the seeds after the corollas have fallen. A pinch at the base will cause these small boxes to gape widely and reveal their contents.

The plants of this species are small perennials, rarely over a foot high, often forming loose mats in the Sierra Nevada or purple beds of bloom in moist ground from British Columbia and Montana to southern California. The skull-caps of the Rocky Mountains (*Scutellaria resinosa*) and of the prairies (*Scutellaria wrighti*) are but little different, though much more prodigal of their flowers. More delicately beautiful are the clusters of another species (*Scutellaria tuberosa*), which adorns the edges of chaparral burns in the mountains of southern California especially. Several species occur in the East, the most fascinating being the pigmy skull-cap (*Scutellaria parvula*), with flowers a quarter of an inch long and a cap of the tiniest.

Prunella (*Prunella vulgaris* L. Plate XVI, figure 4).—Bobbing up here and there among the grasses and other herbs of meadow and roadside, the round-topped clusters of the darkest purple prunellas look absurdly like Topsy-heads bristling with curls. Fewer-flowered inflorescences of lighter purple or pink are more usual, but not so striking.

The wide distribution of this little plant, which rarely overtops twelve inches, is worthy of note, since it has traveled from Europe and Asia to this country, where it may be looked for in fields, grassy places, and woods generally. In the far West it adapts itself to a range of altitudes from sea level to midway up the Sierra. There are no other species of this genus, but the odd little blossoms look superficially enough like the wood mint and skull-cap to suggest a near relationship.

Romero (*Trichostema lanatum* Benth. Plate XVI, figure 5).—The handsome shrubs of romero, ornamented with showy clusters of richly colored, oddly shaped blossoms, resemble escapes from some Persian garden more than natives of western America. The thick covering of fuzzy, violet-colored hairs turns the buds into pink balls of wool and gives a velvety texture to the open purple flowers. Long purple stamens projecting from the hooded upper lip in a coiled group, that uncurls as the blossoms mature, give the name of blue-curls to the genus. This species blooms in early summer and is to be sought on dry ridges in the chaparral belt of southern California.

Thistle Sage (*Salvia carduacea* Benth. Plate XVI, figure 6).—Holding itself haughtily erect and looking down upon humbler companions with an air of elegant disdain, the thistle sage is a pale aristocrat, clothed in white wool, girdled and crowned with lavender. So arrogant does it seem in its fine raiment as to merit the term Persian prince, sometimes bestowed upon it. The leaves at the base of the stem are thistlelike, with spines at the edges and long, soft, white hairs that dim the green to a grayish shade. Toward the tip of the leafless stem occur successive ball-like clusters of woolly buds with purple points and edgings to the calyxes, mingled with lavender blossoms of rare beauty.

The thistle sage is a lover of the Southland, where it may be found in dry or sandy soil of valleys and foothills. The seeds are small, but so full of nutriment that the California Indians grind and boil them into a sort of mush.

That the ancients esteemed the sage highly for its medicinal qualities is seen in the name itself, since salvia is derived from the Latin word meaning "to save."

ROSE FAMILY

Rosaceae

Yellow Avens (*Geum macrophyllum* Willd. Plate XVII, figure 1).—The golden cups of the yellow avens are hidden far from the gaze of passing crowds, and although they descend to sea level in the North, one must climb higher than 5,000 feet elsewhere to view them in their native retreats. These are wet meadows and shaded places in the mountains of North America, whether they be in California or New Hampshire, Montana or Alaska. Two of its relatives, the water avens (*Geum rivale*) and the urban avens (*Geum urbanum*), are found in the eastern part of the country, although the latter was originally European. They have aromatic roots that have been used as tonics and astringents as well as for brewing a weak tea used by invalids in New England as a substitute for more stimulating beverages.

Pink-plumes (*Geum triflorum* Pursh. Plate XVII, figure 2).—Triplet blossoms of bright pink-plumes form graceful groups at the ends of slender rosy stems. The same bright color tinges finely cut leaflets clasping the stem and occasionally tints the edges of the feathery green leaves at the base. Cream-colored petals peeping forth from the cuplike calyx are in pleasing contrast to the gay body-color and add a touch of daintiness to this charming plant. As the flower matures, the pale feathery styles lengthen, and when the petals fall there is left a plumy cluster attached to the group of seedlike fruits.

Pink-plumes may be found quite frequently in open places in the middle altitudes of the Rockies and less commonly in the Sierra Nevada and Cascade Mountains from Tahoe northward, as well as in the northeastern part of the United States.

Potentilla (*Potentilla gracilis* Dougl. Plate XVII, figure 3).—The bright flowers of this potentilla are so like buttercups that one must look closely to discover that they are actually tiny yellow roses. They form loose clusters at the ends of slender but stiff branches and are to be found commonly in grassy clearings, borders of forests, and similar locations throughout the Sierra Nevada.

The most attractive potentillas for the garden are hybrids, since these bloom freely from spring to autumn and not only produce a good proportion of double blossoms, but exhibit a wide range of brilliant colors. Shades of orange, bright and dark reds, such as scarlet and maroon, occur pure or may be beautifully marked with yellow bands.

Shrubby Cinquefoil (*Potentilla fruticosa* L. Plate XVII, figure 4).—Nestling among soft green leaves, the golden blossoms of this cinquefoil sprinkle low shrubs with yellow stars through the short summer days of the higher altitudes or in the far North. They seek the coolness of Alaska and around the world in the boreal or subarctic zones, or climb the mountains to timber line. Untrue to its name of five-leaf, there may be anywhere from three to seven leaflets in each leaf, the margins rolled back, making them seem even narrower than they actually are, and the under surface so covered with silky hairs as to glisten like hoarfrost in the sunshine.

Spiraea (*Spiraea densiflora* Nutt. Plate XVII, figure 5).—The low bushes of spiraea, covered with round-topped clusters of rosy bloom, are not only attractive in their native setting, but are suitable for garden culture as well. Moist, rocky slopes of the Sierra Nevada, north and east to the Selkirks and Teton Mountains in Wyoming, are the homes of this species, while a taller, handsomer one (*Spiraea douglasi*), found also in the East, prefers roadsides and moist meadows. This is called hardhack, or steeple-bush, and although the individual flowers are similar to the sister species, the clusters are spirelike instead of round.

Wild Rose (*Rosa californica* C. & S. Plate XVII, figure 6).—Amid the profusion of exotic roses that crowd the gardens of the Pacific coast or clamber luxuriantly over trellis, fence, and arbor, the simple wild rose may easily pass unnoticed, but in the open country the golden-hearted pink blossoms, covering shrubs and thickets with bloom, charm the eye and fill the air with fragrance.

Roadsides, moist meadows, and banks of streams, from Lower California to Oregon and from the coast to 6,000 feet in the Yosemite, offer the California wild rose favorable locations for growth. At the lower altitudes the bushes may flower throughout the year, but higher up in the mountains they become dwarfed and bloom over a shorter period.

PEA FAMILY

Fabaceae

Crimson Sweetpea (*Lathyrus splendens* Kell. Plate XVIII, figure 1).—Although related to the buttercups on the one hand and the roses on the other, the peas form a distinctive group, looking like neither, with flowers that may be recognized at sight the world over, once the marks of family are known. The garden peas, beans of all sorts, the peanut and indigo, have blossoms built on the same plan as those of the sweetpea, clover, wistaria, broom, acacia, and lupine. There is always present the upright standard of two petals fused into a broad banner, two side petals called wings, and two narrower ones joined into a little canoelike structure, the keel.

Of the wild sweetpeas, none is more beautiful than the crimson sweetpea of southern and Lower California. The magnificent flower clusters enthroned in regal splendor on the shrubs and bushes of the chaparral are so compelling as to tempt from afar to covetous possession. The long, vinelike stems clamber to a height of eight or ten feet, supporting themselves on their

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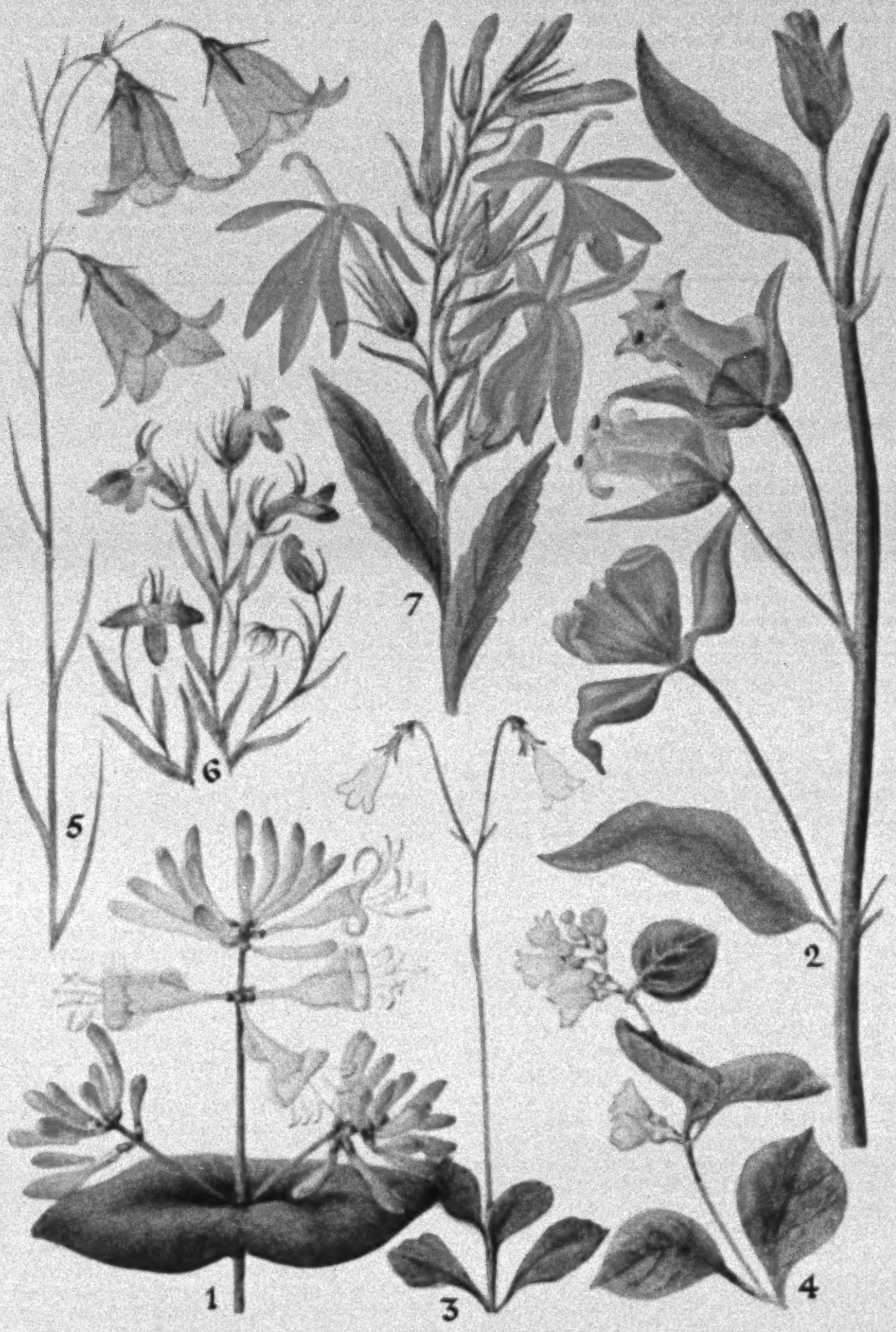
EVENING-STAR FAMILY (*Loasaceae*): (1) Morning-star, *Mentzelia aurea* Lindl. MESEMBRYANTHEMUM FAMILY (*Mesembryanthemaceae*): (2) Noon-flower, *Mesembryanthemum aequilateraie* Haw. CACTUS FAMILY (*Cactaceae*): (3) Yellow Pricklypear, *Opuntia engelmanni* Salm. BUCKTHORN FAMILY (*Rhamnaceae*): (4) Ceanothus, *Ceanothus cyaneus*; (5) Blueblossom, *Ceanothus thyrsiflorus* Esch. PARSLEY FAMILY (*Umbelliferae*): (6) Wild Parsley, *Peucedanum utriculatum* Nutt.



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HONEYSUCKLE FAMILY (*Caprifoliaceae*): (1) Pink Honeysuckle, *Lonicera hispidula* Dougl.; (2) Black Twinberry, *Lonicera involucrata* Banks; (3) Twinflower, *Linnaea borealis* Gronov.; (4) Snowberry, *Symphoricarpos racemosus* Michx. BELLFLOWER FAMILY (*Campanulaceae*): (5) Bluebell, *Campanula rotundifolia* L.; (6) Downingia, *Downingia elegans* Torr. LOBELIA FAMILY (*Lobeliaceae*): (7) Cardinalflower, *Lobelia cardinalis* L.

sturdy neighbors, where the loose clusters of large, crimson blossoms nestle among the branches or crown the summits of the shrubs. Their rare loveliness well merits the term "Pride of California."

Pale Sweetpea (*Lathyrus vestitus* Nutt. Plate XVIII, figure 2).—The pale sweetpea charms with its delicate violet and rose coloring rather than challenges admiration with a striking beauty. Like its sister, the crimson sweetpea, it clambers over the shrubs of the chaparral, but is found more frequently and extends northward beyond San Francisco. The flowers turn yellowish as they fade, and thus mar the attractiveness of the individual clusters, although this habit has its use in informing bees that honey is no longer to be found in such blossoms.

Meadow Lotus (*Lotus oblongifolius* [Benth.] Greene. Plate XVIII, figure 3).—The pale yellow and white flowers of the meadow lotus are to be found now and then growing along mountain streams at lower altitudes, or more abundantly in moist grassy places around mountain springs, where the stems become tall and slender. This form is the one illustrated and is considered a variety (*L. oblongifolius torreyi*). It may be looked for in the Sierra Nevada and north Coast Ranges below 7,000 feet.

The name lotus is applied to widely differing plants. The lotus of the Nile is a water-lily (*Nymphaea*), as is also the East Indian lotus (*Nelumbium*). The jujube tree (*Zizyphus*) is also called lotus, although it belongs to the buckthorn family (*Rhamnaceae*), which is only distantly related.

Velvet Lotus (*Lotus americanus* [Nutt.] Bisch. Plate XVIII, figure 4).—The velvety-soft, gray-green masses of the velvet lotus, dotted with small shell-pink blossoms, clothe fallow fields and roadsides with verdure where dry soil may be a barrier to more exacting plants. It grows so readily throughout the arid belt of the foothills as to be utilized in late summer as an important forage plant. When found at the higher altitudes, such as the floor of the Yosemite, the plants are dwarfed and the foliage less hairy, but even here it is common and daintily attractive.

The velvet lotus boasts many names, being known in the eastern manuals as prairie bird's-foot trefoil, and in some of the western ones as Spanish clover and Dakota vetch, though it is neither a clover nor a vetch. It is found well distributed in dry soil throughout the Middle and Far West.

Hairy Lotus (*Lotus strigosus* [Nutt.] Greene. Plate XVIII, figure 5).—Wherever the grasses of foothills and plains in the South become sparse or are lacking, the bright green mats of the hairy lotus may find a foothold and cover the bare ground with trailing stems and bright yellow blossoms. These turn red as they fade, and so notify the bee that nectar is no longer present. As a rule, the slender stems are but a few inches tall, but such plants as venture in among the grasses and are shaded by them stretch up and become more or less erect.

Bush Lotus (*Lotus glaber* [Torr.] Greene. Plate XVIII, figure 6).—Feathery green, gold, and orange is the effect of the bush lotus, as the long narrow flower clusters sway at the ends of slender curving branches which twine and intertwine on the low shrubs. The bright yellow of the newly opened blossoms turns to orange and finally to orange-red, bending somewhat downward on their stalks as they fade.

Bush lotus is found everywhere, on dry mesa and hillside, clothing the ground after a fire with a characteristically dense tangle of gold and green. The flowers bloom from June to September.

Chaparral Pea (*Pickeringia montana* Nutt. Plate XVIII, figure 7).—The chaparral pea is unusual, both in color of flowers, which are an odd shade of purple, and in its spiny, crooked branches, which mingle with the other shrubs of the chaparral on dry slopes or form a dense, impenetrable thicket where sufficiently abundant. The stiff, branched plants grow to a height of three to eight feet, bearing pretty pea flowers near the ends of the spiny branchlets.

Alfalfa (*Medicago sativa* L. Plate XVIII, figure 8).—Alfalfa may be found growing wild from the Atlantic to the Pacific coast. The dainty little flowers form attractive clusters, varying in tint from pale blue-lavender to dark purple-blue. The seed pods are queer little spirals looking somewhat like a snail's shell. This resemblance is so striking in the pods of the European species (*Medicago scutellata*) called "snails" that practical jokers are fond of putting them into salads and soups as surprises.

Alfalfa has been known as a valuable forage plant for nearly twenty centuries, receiving the name *Medicago* from the country Medea, east of the Mediterranean, and being called alfalfa, which means "best fodder," by the Arabians. From its eastern home it has traveled west across Europe into England, and thence, about the middle of the nineteenth century, to this country, where it has steadily grown in favor as a cultivated crop. In addition to its value for hay and honey, it is one of the best legumes for enriching the soil. See, also, the National Geographic Society's publication, "The Book of Wild Flowers," page 172.

Harlequin (*Lupinus stiversi* Kell. Plate XIX, figure 1).—Dame Nature must have been in a daring mood when she colored the harlequins yellow and pink, for this combination in a flower is as unusual as it is strikingly beautiful. The standard petal waves a banner of bright yellow, while the wings and keel are gaily rose-pink. It is these brilliant and contrasting colors, combined with the jaunty air of the blossoms, that remind one of merry Harlequin.

They are not inclined to leave their comfortable homes in the warm sandy or gravelly spots in the mountains and never travel from the western slopes of the Sierra Nevada or the few favored localities in the Coast Ranges. Where

the forest is open and the shade light, the ground may often be completely covered with the branching, leafy plants, which come into bloom in early summer and soon mature.

Bluebonnet (*Lupinus affinis* Agardh. Plate XIX, figure 2).—Although not covering such vast areas as do some other lupines, the bluebonnets of southern California are individually attractive, as they thriftily take root in heavy, clay soils and put forth spikes of dark blue flowers. As the blossoms age, there appears a crimson spot at the base of the standard, which serves to enhance the beauty of the inflorescence and indicates to the bee that neither nectar nor pollen is longer available.

Dwarf Lupine (*Lupinus nanus* Dougl. Plate XIX, figure 3).—The flowers of the dwarf lupine, a fragrant native of California, catch the eye of both man and insect the more quickly because of the purple-dotted white spot contrasting with the bright blue of the petals. Under cultivation, the dwarf lupines put forth an abundance of flowers and are especially well adapted to borders and masses, since color variations occur frequently.

Beach Lupine (*Lupinus chamissonis* Esch. Plate XIX, figure 4).—The shrubby plants of the beach lupine, with their silvery green leaves and large spikes of blue pea flowers, are a frequent sight near the sea, where they form clumps on the dunes along the shore. The Nature lover must be content, as a rule, to recognize this lupine by these earmarks, since the blossoms vary so greatly in size and color as to be split up into several species which can be distinguished only by the specialist. The showy fragrant flowers bloom very nearly throughout the year and may be found in their sandy homes from southern California to Oregon.

Yellow Lupine (*Lupinus arboreus* Sims. Plate XIX, figure 5).—Shifting sand dunes near the coast may be held in check by the long roots of yellow lupine shrubs, while above ground the blue-green leaves and splendid spikes of bright blossoms ornament the landscape and perfume the air. In the spring the sandy hills of the coast from central California southward may be unbroken masses of these plants, calling forth admiration and wonder at their beauty of form and profusion of bloom. The individual flowers are large and showy and very similar to a near relative (*Thermopsis montana*) of mountain meadows in Oregon, Washington, and the Rockies.

Vetch (*Vicia americana* Muhl. Plate XIX, figure 6).—Rose-purple and pale pink, the butterfly blossoms of the vetch perch jauntily on wayside bushes, which have been festooned by its trailing stems and curling tendrils. The pretty little leaflets are numerous and dark green, varying so much in shape in different localities that varieties have been named accordingly. These grow readily in moist lands across the continent, but may easily be confused with some species of sweetpea, since the flowers are very similar.

One must peep within the keel to see whether the hairs of the stigma form a tuft at the end of the style or extend in a line down the latter, as in the sweetpea.

Scarlet Loco (*Astragalus coccineus* Brand. Plate XIX, figure 7).—As rare as it is brilliant, the scarlet loco belongs more to the desert than to the coast, although it ventures within sight on the latter on the mountains of southern California. The low-growing plants combine silvery gray leaves with gay blossoms into a color scheme both unique and beautiful. Outside of its intrinsic charm, the scarlet loco is interesting because of its connection with relatives notorious for the enormous losses they have occasioned stockmen. Everyone has heard of the effects of these "crazy-weeds" and is familiar with the Spanish term "locoed" as referring to abnormal mental behavior. The great danger lurking in loco weeds on the range is not due so much to the virulence of their poison as to the fact that it seems to be a habit-forming drug, and stock, once having acquired the taste, indulge it to such an extent as to bring about their destruction. The purple loco (*Astragalus mollissimus*) of Texas and New Mexico, the blue loco (*Astragalus diphysus*) of Arizona and the Southwest, and the white loco (*Oxytropis lamberti*), which covers vast areas of the plains region east of the Rockies, are the worst offenders.

ORPINE FAMILY

Crassulaceae

Live-forever (*Cotyledon pulverulenta* B. & H. Plate XX, figure 1).—Where there is sufficient moisture the live-forevers may reach a height of five feet, the slender inflorescences of crimson and yellow raying out from the stem like bright streamers. On exposed and arid hill slopes of southern California the plants are dwarfed and the fleshy leaves at the base of the stem not so conspicuously covered with the white powder that is usually found on this species.

Two orpines, or stonecrops, of common interest have similar yellow starlike flowers and fleshy leaves. One (*Sedum douglasi*) may be found in rocky situations of the Northwest, while the other (*Sedum stenopetalum*) grows in open gravelly soil throughout the foothills and ranges of the Rocky Mountains.

SAXIFRAGE FAMILY

Saxifragaceae

Yellow Saxifrage (*Saxifraga hirculus* L. Plate XX, figure 2).—The slender stem of the yellow saxifrage seems scarcely sufficient to bear the golden cup of a flower at the end. It is an inconspicuous little perennial that blooms unobtrusively all summer long in subalpine or arctic bogs and may be coaxed to do the same in any cold, damp location.

GOOSEBERRY FAMILY

Grossulariaceae

Garnet Gooseberry (*Ribes speciosum* Pursh. Plate XX, figure 3).—The long, curving

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ASTER FAMILY (*Asteraceae*): (1) Goldenrod, *Solidago serotina* Ait.; (2) Aster, *Aster chilensis* Nees, (3) Woolly Aster, *Corethrogyne filaginifolia* Nutt.; (4) Daisy, *Erigeron divergens* T. & G.; (5) Gumweed, *Grindelia robusta* Nutt.; (6) Pentachaeta, *Pentachaeta aurea* Nutt.

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ASTER FAMILY (*Asteraceae*): (1) Wyethia, *Wyethia angustifolia* Nutt.; (2) Bush Sunflower, *Encelia californica* Nutt.; (3) Coreopsis, *Coreopsis tinctoria* Nutt.; (4) Desert Coreopsis, *Coreopsis bigelovi* (Gray) Hall; (5) Goldweed, *Verbesina encelioides* B. & H.

branches of the garnet gooseberry, thickly beset with dark shining leaves and hung with crimson blossoms like pendant jewels, give a note of Christmas gaiety to the canyons of southern California. At a little distance the effect is very like that of holly wreaths and berries in a setting of spring verdure instead of snow and evergreens.

The brilliantly colored flowers hang down on the underside of the branches, their long red stamens forming a fine fringe ending in groups of jeweled anthers.

This species, sometimes known as the fuchsia-flowering gooseberry, is limited in range to the foothills of southern California, and, although an evergreen in a mild climate, is not hardy in a northern one.

Flowering Currant (*Ribes sanguineum malvaceum* Loud. Plate XX, figure 4).—The delicate pink of the hanging flower clusters, combined with wrinkled leaves in soft tones of green, entitle the flowering currant to consideration as an ornamental shrub, whether cultivated or growing wild, in central and southern California. The species has redder blossoms than the variety, and dark purple berries that are rough-hairy, dry, and bitter. The tall shrubs have a fragrant resinous odor reminiscent of incense. They occur naturally in the Coast Mountains as far north as British Columbia and southward through California and Mexico, but are hardy enough to be satisfactorily grown in the East as well.

Golden Currant (*Ribes aureum* Pursh. Plate XX, figure 5).—Whiffs of a spicy fragrance announce the presence of the golden currant even before the long-tubed, yellow blossoms are seen among the thin, light green leaves. To an Easterner finding it in moist canyons on the coast, it conjures up memories of old-fashioned gardens at home, while the Middle Westerner recognizes it as a wild flower of hills and river banks. Occasionally the tiny petals at the mouth of the pale yellow tube are a bright red and the berries may be either red or black as well as yellow. Regardless of their color, they are eagerly sought for pies, homemade jams, and jellies, being considered equal to the fruit of the cultivated currants (*Ribes sativum, R. rubrum*, etc.).

EVENING-PRIMROSE FAMILY

Onagraceae

Hummingbird-trumpet (*Zauschneria californica* Presl. Plate XX, figure 6).—The hummingbird-trumpet sets the dry or rocky hills of central and southern California ablaze with scarlet-vermilion blossoms. Their trumpet shape and red color mark them as humming bird flowers and suggest a name more suitable than that of California fuchsia, often used. The brilliant flowers set among attractive gray-green foliage make this species desirable for masses of autumn bloom in the garden, especially as the plants are perennial and easily grown from rootstocks.

Fireweed (*Epilobium angustifolium* L. Plate XXI, figure 1).—Among the first to take advantage of ground laid bare by logging or fire in forests of spruce and fir, the narrow-leaved plants of the fireweed, also known as blooming sally, put forth long spires of rose-purple blossoms and turn scenes of desolation and destruction into gardens of beauty.

In the fall, when the bright flowers have given way to purplish pods, the leaves take on tints of the flames that earlier swept the ground and prepared the way. Although especially adapted to this work of reclamation, when there is none to be done the fireweed is content to decorate meadows and stream banks, whether east, west, north, or south, and whether at home or abroad, in Europe and Asia. For further details, see the National Geographic Society's publication, "The Book of Wild Flowers," page 96.

Godetia (*Godetia quadrivulnera* Dougl. Plate XXI, figure 2).—The charm of this small-flowered godetia may suffer by comparison with its radiant sisters, but, taken alone, the rich purple cups borne on slender stems possess a beauty not to be denied, as they respond to the call of spring on dry hillsides and in open places of the chaparral. They are also found among the pines at lower altitudes, but never very far north.

Farewell-to-spring (*Godetia amoena* Lilja. Plate XXI, figure 3).—The larger godetias are among the most charming of spring flowers. The blossoms are large and cupped, the petals of a delicate satiny texture, and the ground color pinkish lavender to rose-purple, variegated often with spots and markings of fiery rose-red. The species illustrated is so esteemed as to be cultivated abroad, while Dame Nature takes care of it in America all along the western coast. There are white-flowered as well as crimson ones blotched with a deeper color, and sometimes the blossoms become double, especially in the garden.

The common name of this flower refers to the fact that, although it begins to bloom early in the season, many blossom up to the very end, their gay colors waving a farewell to spring after grasses and other herbs have turned brown and dry.

Fringed Clarkia (*Clarkia concinna* [F. & M.] Greene. Plate XXI, figure 4).—Bright patches of rose-purple on shady slopes in the Coast Mountains of California signal from afar the presence of the fringed clarkia, while a nearer view reveals the oddity of the individual blossoms. Instead of a prim regularity, they present an almost fantastic appearance, with their flaring petals cut into ribbons and raying out from narrow bases. Another clarkia (*Clarkia pulchella*), sometimes called pink fairies, is quite similar, but confines itself to the mountain slopes of Oregon and Washington and eastward to the Rockies.

Clarkias are named in honor of Captain William Clark, of the Lewis and Clark Expedition, which crossed the American continent in 1803-6, finding time to collect the plants of a

new world in the midst of many arduous undertakings.

Tall Clarkia (*Clarkia elegans* Dougl. Plate XXI, figure 5).—The rose-purple flowers of this clarkia show their resemblance to their cousins, the fireweeds, in both shape and color of the foursquare blossoms, although the petals are quite round in outline, with narrow bases. The stems often grow to a height of six feet, bearing the flowers toward the ends of the branches, intermingled with leaves. They are quite common in spring and early summer in the chaparral belt of central and southern California, often making lovely masses of color on hillside and lower mountain slope.

Sun-cups (*Oenothera bistorta* Nutt. Plate XXI, figure 6).—The leafy stems of the sun-cups, thickly beset with bright golden disks, trail over the warm sands of the coast of southern California, where the wind is cool and there is plenty of moisture, or they lift themselves more stiffly erect on plain or hill, where herb and grass seek their share of light and water. A dark brown spot at the base of each petal emphasizes the clear yellow which turns a rich orange-red as the flower fades. A reddish tinge on stems and seed pods and the gray-green of the leaves add still greater variety of coloring to the whole.

The family to which the sun-cups belong is the one containing also the fireweeds and the evening-primroses. The yellow evening-primrose (*Oenothera missouriensis*) of the middle western plains bears magnificent blossoms, sometimes as large as six or eight inches in diameter, while an almost equally large white-flowered species (*Oenothera caespitosa*) ventures farther west across the Colorado plains and up into the lower parts of the Rockies. This beautiful blossom opens between 5 and 7 o'clock in the evening, the delicate white petals folding back and smoothing out their crinkles in from two to seven minutes, so that the movement, usually imperceptibly slow in other flowers, may easily be seen.

EVENING-STAR FAMILY

Loasaceae

Morning-star (*Mentzelia aurea* Lindl. Plate XXII, figure 1).—Great five-pointed star-flowers with a satiny sheen to the petals, a glowing orange-red center setting off a feathery mass of stamens, open early in the morning and send a sweet fragrance abroad. Whether brightening stony streamways in the California mountains or massed in the garden, this morning-star, which is sometimes confused with another species (*M. lindleyi*) and erroneously said to open in the evening, is strikingly beautiful.

MESEMBRYANTHEMUM FAMILY

Mesembryanthemaceae

Noon-flower (*Mesembryanthemum aequilaterale* Haw. Plate XXII, figure 2).—Along the seacoast from San Francisco to Patagonia, the trailing juicy stems and leaves of the noon-flower hang curtains of vivid green over the sea cliffs or spread soft mats on the bare earth. An early morning or late afternoon sight of this verdure gives no hint of the transformation to be wrought on a bright noonday, but under the caressing touch of the sun's rays scores of narrow bright magenta petals curve outward and form a thick fringe about the group of pale yellow stamens in the center. There are hundreds of these blossoms, which are three or four inches in diameter and fragrant. In the shadow or at evening, the petals fold together again, shutting up shop until another sunny day.

This species, characterized by three-sided stems, has been brought into this country from its home in Africa, perhaps for the sake of its fruit, which is pulpy, somewhat resembling a small fig, so that it is sometimes called sea-fig and fig-marigold.

CACTUS FAMILY

Cactaceae

Yellow Pricklypear (*Opuntia engelmanni* Salm. Plate XXII, figure 3).—The cacti are all American, and the great arid regions of Mexico and our own Southwest attract travelers from far and wide by the variety and oddity of form and beauty of blossom exhibited by these weird plants. (See, also, "Canyons and Cacti of the American Southwest," in the NATIONAL GEOGRAPHIC MAGAZINE for September, 1925.)

The yellow pricklypear bears large flowers, several inches across, the many lemon-colored petals tinged with red and of a silken transparency. The fruits are sweet and edible, if one avoids the barbs, and may be found on the market in California. The pulp is red, and when small boys indulge too freely their faces present the same telltale evidence as of a stolen visit to the jam pantry.

The flat stems furnish forage for range cattle during periods of drought, when other feed is scarce or lacking. It cannot be said that stock eat the spiny *Opuntias* from choice, but when forced to do so or starve, they may escape starvation only to die from the effects of the masses of sharp spines on the alimentary tract. This species is also of considerable importance as a honey producer, especially in Texas, where it is unusually abundant.

BUCKTHORN FAMILY

Rhamnaceae

Ceanothus (*Ceanothus cyaneus*. Plate XXII, figure 4).—The dark green, glossy-leaved shrubs of ceanothus deck themselves with tiny plumes of pale azure or darkest blue, as the clustered buds respond to the warmth of the spring sunshine. There are many different kinds of ceanothus to be found on the Pacific coast, all extremely attractive shrubs with shiny leaves and feathery clusters of tiny blossoms, which range in color from pure white, through azure blue, to the dark purple-blue of this garden hybrid.

The red-root, or Jersey-tea (*Ceanothus americanus*), of the East has white flowers and leaves that were used for tea during the Revolutionary War.

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ASTER FAMILY (*Asteraceae*): (1) Woolly Eriophyllum, *Eriophyllum lanatum* Forbes; (2) Golden Eriophyllum, *Eriophyllum conferti florum* DC.; (3) Pincushions, *Chaenactis glabriuscula* DC.; (4) Baeria, *Baeria chrysostoma* F. & M.; (5) Venegasia, *Venegasia carpesioides* DC.; (6) Gaillardia, *Gaillardia aristata* Pursh; (7) Lasthenia, *Lasthenia glabrata* Lindl.

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ASTER FAMILY (*Asteraceae*): (1) Tidy Tips, *Layia elegans* T. & G.; (2) Tarweed, *Hemizonia congesta lutescens* Babcock & Hall; (3) Showy Madia, *Madia elegans* Don; (4) Arnica, *Arnica cordifolia* Hook.; (5) Bush Senecio, *Senecio douglasi* Dougl.; (6) California Senecio, *Senecio californicus* DC.

Blueblossom (*Ceanothus thyrsiflorus* Esch. Plate XXII, figure 5.—Of the many floral harbingers of spring, none is lovelier than this species of ceanothus, as the plumy clusters of azure flowers burst into bloom over chaparral-covered hill slope or among the redwood trees. The shrubs are shiny-leaved and evergreen and the blossoms fragrant. If rubbed up with water, they will form a lather that is a satisfactory substitute for soap, but they cause disappointment if gathered for bouquets, as the tiny flowers fade rapidly and drop off soon after being picked.

PARSLEY FAMILY

Umbelliferae

Wild Parsley (*Peucedanum utriculatum* Nutt. Plate XXII, figure 6).—Physician, confectioner, and housewife daily accept the services of the great family to which the familiar parsley owes allegiance.

The feathery foliage and yellow flower clusters of the wild parsley are familiar sights on the mesas and grassy foothills of southern California in the early spring, giving way later in the season to broad-winged fruits resembling brown-striped bugs. The sanicle (*Sanicula menziesi*), which may be mistaken for the wild parsley in general appearance, has less finely cut leaves and takes more readily to moist woods and clay soils in the same general region.

HONEYSUCKLE FAMILY

Caprifoliaceae

Pink Honeysuckle (*Lonicera hispidula* Dougl. Plate XXIII, figure 1).—One scarcely needs an introduction to the garden honeysuckles, ornamental climbers famed for their fragrance or bright coloring.

Although the honeysuckle of the western coast lacks odor, the delicately pink blossoms may be recognized by a close similarity in form, the long, narrow tube, curled-back, two-lipped corolla lobes, and protruding stamens suggesting its relationship to one familiar with other honeysuckles. It is usually found clambering over trees and shrubs in the canyons and along streams from British Columbia to California.

Black Twinberry (*Lonicera involucrata* Banks. Plate XXIII, figure 2).—Pairs of orange-red or yellow blossoms appear here and there on the tall woody stems of the black twinberry, which climb up through trees in moist places of the hills and mountains in the Sierra Nevada and Coast Ranges or in wooded grounds through Canada, west to Alaska, and southward in the Rocky Mountains.

Beneath each pair of twin blossoms are two broad, leafy bracts that turn bright crimson as the flowers fade, and, turning back, finally reveal two shining black berries which look delicious, but which are bitter to the taste. The fruits of some of the bushy species are used as emetics or cathartics.

Twinflower (*Linnaea borealis* Gronov. Plate XXIII, figure 3).—Twice charmed are the northern woods whose cool shadows are brightened by the fairylike grace of the twinflower. Scarcely less attractive than the two fragrant pink blossoms, nodding from slender stalks, are the shining mats of evergreen leaves which carpet the forest floor. It is especially common in the forests of Sweden, and so is appropriately named after the great botanist of that country, Linnaeus, who is often represented holding a spray of the blossoms.

Not only do northern woods in this country, Europe, and Asia offer a home to this little evergreen plant, but wherever there is moisture and coolness—in the bogs of New England, northward in the Rockies and Sierra Nevada, from California northwest to the Alaskan Islands—there also it may be found creeping over the ground and perfuming the air. It will also thrive under cultivation if given a porous soil of mold or peat, especially if shaded.

Snowberry (*Symphoricarpos racemosus* Michx. Plate XXIII, figure 4).—Coralberry and snowberry, red berry and white, cling to the bushes from late summer through the autumn days and well into winter, often adding their pearly luster and cheery red to many a winter landscape. In the spring, after the snow has melted from rocky banks of the northern States and the rains have soaked into the California hills, the snowberry puts forth a wealth of smooth green leaves and, as the season advances, hides among them drooping clusters of pale pink bellflowers.

BELLFLOWER FAMILY

Campanulaceae

Bluebell (*Campanula rotundifolia* L. Plate XXIII, figure 5).—Unaware of world-wide, age-old fame in song and story, graceful bluebells nod on slender stems, from rocky banks or grassy mountain slopes, throughout the Northern Hemisphere, and pursue their business in life of attracting insects and forming seeds in serene unconsciousness. If visitors fail to heed the invitation to stop and eat, the movements of anthers and stigma go on with clocklike precision, performing their appointed tasks unaided by bee or butterfly. For further details, see the National Geographic Society's publication, "The Book of Wild Flowers," page 56.

Downingia (*Downingia elegans* Torr. Plate XXIII, figure 6).—Wherever found, the ethereal blue blossoms and soft green leaves of downingia turn unsightly muddy spots into miniature gardens of loveliness. They can easily be persuaded to transfer their beauty to garden or room if care is taken to carry a section of the mud in box or pan, so that the roots are undisturbed.

Another downingia (*Downingia pulchella*) is similar, but smaller in every way. It, too, grows in muddy spots in California and Oregon or ventures eastward to Nevada and Idaho.

LOBELIA FAMILY

Lobeliaceae

Cardinalflower (*Lobelia cardinalis* L. Plate XXIII, figure 7).—Most brilliant of all our red flowers and extremely showy against a background of dark green of older leaves above and

the paler green of grasses below, the cardinal-flower may occasionally be found in wet places in the mountains. The leafy stems stretch up among the swamp grasses to a height of several feet and bear one-sided spikes of vivid cardinal-red blossoms with slender tubes and long, narrow lobes.

Swamps, ditch banks, and low wet ground in the eastern part of the country, south to Florida and west to the borders of Texas, are the favored haunts of the cardinalflower, which has in some way reached similar places in the mountains of southern California.

ASTER FAMILY

Asteraceae

Goldenrod (*Solidago serotina* Ait. Plate XXIV, figure 1).—Slim and rodlike or branched and feathery, goldenrods flare forth like yellow torches, from marsh and river bank, plain and hillside, mountain meadow, roadside, and field, until chill winds and soggy autumn days quench their flickering. None but the specialist need be concerned with the difficult distinctions between the many kinds. All but three or four of the eighty or more species belong to North America, and every condition of soil and climate the country over has its favorite sort.

With one exception, all goldenrods are bright yellow throughout.

It is fitting that a native of almost every State in the Union should be chosen the State flower by more than one of our Commonwealths and receive consideration as the national flower as well.

Aster (*Aster chilensis* Nees. Plate XXIV, figure 2).—Inseparable as Damon and Pythias, purple aster and yellow goldenrod appear side by side as signals to Summer that her reign nears its close and Autumn is at hand.

Unlike goldenrods, the aster community of tiny yellow tube flowers in the center of the head is surrounded by numerous long and narrow ray flowers of contrasting color—pink, lavender, purple, or white.

Woolly Aster (*Corethrogyne filaginifolia* Nutt. Plate XXIV, figure 3).—The pink rays of the woolly aster, encircling golden centers and borne on branches covered with soft white hairs, form a color scheme unusually lovely against the dark green of the chaparral. The leaves are small and also clothed in a dense white wool which is designed to protect against the drying effect of late summer days rather than to guard against the cold. From southern California, all along the coast to Oregon, bare and rocky ledges below an altitude of 5,000 feet may harbor specimens of the woolly aster, and, although variations in leaf shape and arrangement of the heads are frequent, the plant is readily recognized by its characteristic combination of colors.

Daisy (*Erigeron divergens* T. & G. Plate XXIV, figure 4).—The slender, soft-hairy stems of this little daisy bear flower heads with golden centers and violet or bright pink rays so like the aster as to be distinguished only by close inspection.

The low tufts of gray-green foliage, mingled with the gracefully borne delicate flowers, are charming, not only in the garden, but wherever found in the loose soil of the Coast Mountains, or eastward to Texas on plains and river banks. There are, perhaps, 100 other species in the West, among which mention should be made of the mountain daisy (*Erigeron salsuginosus*), abundant in the higher mountains and in moist places as far east as Colorado.

A little cousin from western Europe, the English daisy (*Bellis perennis*), is a favorite of American gardens, but "runs away" whenever it can and stars grassy lawns with its dainty flower heads, yellow-centered and with white or rose-colored rays. This is the daisy famed in history, legend, and poetry.

Gumweed (*Grindelia robusta* Nutt. Plate XXIV, figure 5).—Ranged stiffly by the side of the road, the awkward yellow-headed gumweeds neither bend nor curtsy as one passes by, and it is only the brisker breezes that can ruffle their dignity. The clumsy buds, with their narrow turned-down bracts, look like huge burrs and are covered with a white gummy substance that makes them unpleasant to touch.

This species of gumweed is to be found in summer on dry hills of the western part of California. On the plains and prairies from the Mississippi River westward, the common species (*Grindelia squarrosa*), often called rosin-weed, is very similar to the one illustrated and easily recognized as a gumweed.

Pentachaeta (*Pentachaeta aurea* Nutt. Plate XXIV, figure 6).—The bright golden disks of pentachaeta, with their thick fringe of narrow rays, gleam among the grasses on a clear morning like miniature suns radiating light. They end the day's work in the afternoon, closing the rays together and going to sleep, and they refuse to work at all if the temperature is too chill. Their spicy fragrance is somewhat like that of goldenrod.

Only the southernmost counties of California seem to suit this stay-at-home, which strikes root in warm, loose soil and blooms in the spring.

Wyethia (*Wyethia angustifolia* Nutt. Plate XXV, figure 1).—The great heads of wyethia, rich in tones of yellow, are veritable giants in the sunflower tribe. Each is so large as to need its own stalk, and a stout one at that, which rises from a resinous root and a group of basal leaves, also large and with wavy margins.

To someone's fancy, these leaves have seemed ever to point north and south, and thus furnish a guide to the traveler, but the name of compass-plant, bestowed in consequence, is singularly inappropriate, for the species is even more unreliable as an indicator than the compass-plant of the prairies (*Silphium laciniatum*).

Wyethia is found over an area limited to moist ground in the plains and hills from Washington to Monterey Bay, California.

More widely distributed in moist valleys and plains and in the Rocky Mountains from Colorado westward to Nevada and British Columbia,

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ASTER FAMILY (*Asteraceae*): (1) Western Thistle, *Carduus occidentalis* Nutt.; (2) Star Thistle, *Centaurea melitensis* L. CHICORY FAMILY (*Cichoriaceae*): (3) Hypochaeris, *Hypochaeris radicata* L.; (4) Malacothrix, *Malacothrix californica* DC.; (5) Wild Lettuce, *Lactuca pulchella* DC.; (6) Agoseris, *Agoseris retrorsa* Gray; (7) Chicory, *Cichorium intybus* L.

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LILY FAMILY (*Liliaceae*): (1) Firecracker Flower, *Brodiaea coccinea* Gray; (2) Ithuriel's Spear, *Brodiaea laxa* Benth.; (3) Blue Brodiaea, *Brodiaea capitata* Benth.; (4) Golden Brodiaea, *Brodiaea ixioides* Wats.; (5) Golden Stars, *Bloomeria aurea* Kell.; (6) Nodding Onion, *Allium cernuum* Roth; (7) Purple Onion, *Allium fimbriatum* Wats.

another species (*Wyethia amplexicaulis*), similar in appearance, sometimes covers considerable areas with rich foliage and glowing flowers.

Bush Sunflower (*Encelia californica* Nutt. Plate XXV, figure 2).—The low, dark green shrubs of *Encelia*, covered with cheery yellow and brown flowers, are a conspicuous feature of the lower portions of the chaparral belt, where they brighten the landscape with bloom, whatever the season. Although most at home on the low hills along the coast from Monterey to San Diego, the bush sunflower may be found as far east as Arizona, where a smaller-flowered form takes its place, while in the San Bernardino and Riverside valleys the silvery leaved brittle-brush (*Encelia farinosa*) covers the hills with silver and gold. This is sometimes called incense plant, from its use in the churches of Lower California. The common sunflower (*Helianthus annuus*) of our western plains is, perhaps, the most famous of the bush sunflower's near relatives.

Coreopsis (*Coreopsis tinctoria* Nutt. Plate XXV, figure 3).—The bright yellow tips of the broad rays of coreopsis form golden halos about the rich crimson centers and enhance the airy grace of feathery foliage and slender flexible stems. The charming flower heads bend and sway on these threadlike stalks, transforming unsightly ditch banks into scenes of loveliness. This coreopsis was brought to the Pacific coast from its home in the East.

Desert Coreopsis (*Coreopsis bigelovi* Hall. Plate XXV, figure 4).—The pretty heads of the desert coreopsis in two shades of yellow—golden rays and orange centers—are borne on slender stems which spring from a tuft of shining, somewhat succulent and finely cut leaves. They brighten warm, sandy places in southern California and near-by Arizona, being especially fond of borders of the desert. A near relative (*Coreopsis maritima*), sometimes called sea dahlia, on the contrary, prefers the shore and forms one of the strikingly handsome plants on the coast of San Diego County and near-by islands.

Goldweed (*Verbesina encelioides* B. & H. Plate XXV, figure 5).—In spring and summer the goldweed spreads a golden glory over fallow fields and waste places. The leafy branching plants grow to a height of several feet and bear many heads an inch or two in diameter. At home in Texas and southern Colorado to Arizona, it has traveled far and wide into the warmer parts of the country and may be frequently found under cultivation as well.

Woolly Eriophyllum (*Eriophyllum lanatum* Forbes. Plate XXVI, figure 1).—The woolly eriophyllum might well be taken for a yellow daisy if judged by external appearance. It is an attractive plant, with many golden flower heads on slender stalks, dark green leaves, and a covering of white wool on the under side of leaves, buds, and stems. This white down is characteristic of the many different forms of this plant. Hillsides from coast to mountain and in the Yosemite are the localities in which one may find this cheery little perennial.

Golden Eriophyllum (*Eriophyllum confertiflorum* DC. Plate XXVI, figure 2).—The small yellow flower heads of the golden eriophyllum are closely crowded into flat-topped clusters like those of some goldenrods. The stems are covered with the white down characteristic of this genus and, as they frequently occur in clumps, the masses of bloom are often strikingly beautiful. The plants are bushy perennials with woody bases and are found commonly in the hills and mountains of the lower part of the chaparral belt in central and southern California, and occasionally on warm rocky slopes in the Yosemite below 6,500 feet.

Pincushions (*Chaenactis glabriuscula* DC. Plate XXVI, figure 3).—The golden heads of pincushions have an outer row or two of scalloped flowers arranged like a double ruffle around a soft, cushiony center. This is smooth before the disk flowers open, but takes on the appearance of being stuck full of golden pins as the narrow tubes of these elongate. The flower stalks are long and slender, rising from a basal tuft of prettily cut leaves, and, although covered with white wool at first, lose this as they grow older, and then become smooth and green.

From April to June one may find these charming plants in the lower hills and along the coast of middle and southern California. They are partial to loose, sandy soil or somewhat rocky ground, but when growing in the shade of taller herbs or grasses may become tall and slender or show other variations, according to changing conditions.

Baeria (*Baeria chrysostoma* F. & M. Plate XXVI, figure 4).—Massed on cliffs near the California shore, baeria forms a cloth of gold, varied here and there with the paler yellow of the evening-primroses, the glowing orange of California-poppies, yellow tidy tips and senecios, and embroidered at the edges with the lavender of phacelias and white of the popcorn-flower.

In the spring foothill slopes and plains are often so thickly clothed with baeria blossoms that one's shoes become golden with the pollen, and the name of goldfields is given to the species.

Although thriving best in moist ground throughout the State, nothing daunts this hardy little annual. Where there is plenty of water in the soil, the plants may grow a foot tall and bear large heads, but when pressed for moisture on hard, rocky trails, they do well to become an inch-and-a-half tall, becoming much bunched, with tiny leaves and heads less than one-fourth of an inch across.

Venegasia (*Venegasia carpesioides* DC. Plate XXVI, figure 5).—Like miniature suns, with their bright yellow centers and many paler yellow rays, the heads of venegasia droop slightly at the ends of red-brown branches. The long-pointed, light green leaves with toothed edges cluster thickly about the scattered heads and along the woody stems, forming shrubs of

unusual beauty in shady canyons and along banks of streams in southern California.

Gaillardia (*Gaillardia aristata* Pursh. Plate XXVI, figure 6).—Gaillardias, with their wealth of bloom and gorgeous colorings, are familiar sights in gardens everywhere, as well as growing wild on western plains. The centers are usually orange or orange-red, while the rays run the gamut of yellows, from pure canary to deeper yellow blotched with crimson at the base. In the larger heads the ray flowers may be an inch-and-a-half long, making these splendid specimens into setting suns of glowing color more than three inches across.

On southern plains, from Louisiana west to Arizona, there is the rose-ring gaillardia (*Gaillardia pulchella*) that is startling in its vivid coloring. The tips of the rays are yellow, but for most of their length they are a rich reddish purple that catches the eye from afar. The plants are especially abundant in Texas, where they furnish large quantities of yellow honey, which is greatly esteemed.

Lasthenia (*Lasthenia glabrata* Lindl. Plate XXVI, figure 7).—Resembling its close relative, baeria (figure 4), but with larger heads, lasthenia spreads beautiful yellow sheets of bloom over ground that is low and wet. It is not at all averse to a moderate amount of alkali in its water supply, and, finding this quite to its taste in salt marshes along the coast, may frequently be found in such localities.

Tidy Tips (*Layia elegans* T. & G. Plate XXVII, figure 1).—The pure white edges of the broad, scalloped rays of tidy tips form pale halos around the golden centers and bestow an air of crisp freshness lacking in forms entirely yellow. Reddish purple stems and prettily cut leaves silvered over with fine hairs play their part in completing the beauty of the plants. They are quite worthy a prominent place in the garden and will repay cultivation with a wealth of bloom and luxuriant foliage.

Southern California is blessed with two species of tidy tips looking so much alike that it is necessary to pull the head apart and look carefully at its structure to determine which is which, even though the one (*Layia platyglossa*) which ranges farther north than Santa Barbara is supposed to be less frequently pure yellow than the other (*Layia elegans*).

Another lovely *Layia* (*Layia glandulosa*), that has large heads with pure white rays about a yellow center, may be found in barren or sandy soil as far north as British Columbia and east to Idaho and New Mexico.

Tarweed (*Hemizonia congesta lutescens* Babcock & Hall. Plate XXVII, figure 2).—The tarweeds are not to be mistaken by one who tramps abroad in late summer and autumn, for the crushed herbage gives forth a distinctive spicy odor that is pleasant or disagreeable, according to one's taste in perfumes.

The tarweed illustrated is one of many forms of the species. It usually grows in dry, open ground throughout California.

Showy Madia (*Madia elegans* Don. Plate XXVII, figure 3).—When blotched with crimson, as they often are, the bright yellow heads of the showy madia look very like those of coreopsis, but the resemblance ends there, for the plants are stout and sticky instead of smooth and graceful. The characteristic tarweed odor is also present and, although this is disagreeably suggestive of turpentine at close range, faint whiffs of it may be found spicily pleasant.

In spite of the fact that the plants are common on hills from southern California to Oregon and east to Nevada, they make no great show of bloom, owing to their habit of flowering in the evening and sleeping in the sunshine. If planted in the shade in the garden, the flowers will remain open all day.

Arnica (*Arnica cordifolia* Hook. Plate XXVII, figure 4).—To most of us, arnica is a term that arouses recollections of painful sprains and bruises rather than visions of beautiful flowers. Nevertheless, the soothing lotion applied to such local pains may be traced back through processes of extraction to root or flower of the arnica (*Arnica mantana*), which dwells in mountain meadows and looks like a narrow-leaved form of the arnica illustrated. The heads of the latter are borne singly on hairy stems, usually about a foot tall, and have bright yellow toothed rays and darker yellow centers, with a rather deep, hairy involucre.

Bush Senecio (*Senecio douglasi* Dougl. Plate XXVII, figure 5).—The bush senecio is a shrubby perennial, usually three or four feet high, occupying open plains and hills in the West. It may also climb warm slopes in California to an altitude of 5,000 feet and, since it blooms as late as December, is frequently conspicuous when other flowers are scarce.

California Senecio (*Senecio californicus* DC. Plate XXVII, figure 6).—One unfamiliar with the powerful influence of differing environments on plants would scarcely believe that the queer-looking little dwarf on the strand bears the same name as the tall, slender form growing in the shade of other herbage on the hilltop. The former is bunchy, an inch-and-a-half tall, and bears a few flower heads absurdly large by contrast, while the latter is two feet or more in height, slender and unbranched, with but one head.

These smooth little annuals with lance-shaped leaves confine their activities to southern California, but are quite able to adapt themselves to the sand dunes along the shore as well as to dry places in the valleys and foothills, especially if the soil is somewhat sandy. The bright yellow flowers appear in February and continue blooming until May.

Western Thistle (*Carduus occidentalis* Nutt. Plate XXVIII, figure 1).—The western thistle forms stately groups of tall branching plants with crimson flowers so long and slender that they seem to rise from gray involucres like flames from a brazier. Guarded against spoliation by their armoring of sharp spines, protected against drought by their cobwebby covering of

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LILY FAMILY (*Liliaceae*): (1) Butterfly-mariposa, *Calochortus venustus* Dougl.; (2) Lilac Mariposa, *Calochortus splendens* Dougl.; (3) Yellow Mariposa, *Calochortus luteus* Dougl.; (4) Fairy Lantern, *Calochortus albus rubellus* Greene; (5) Yellow Pussy-ears, *Calochortus monophyllus* Lem.; (6) Mission Bells, *Fritillaria lanceolata* Pursh; (7) Purple Trillium, *Trillium sessile* L.

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LILY FAMILY (*Liliaceae*): (1) Tiger Lily, *Lilium humboldti* R. & L.; (2) Leopard Lily, *Lilium pardalinum* Kell.; (3) Chaparral Lily, *Lilium rubescens* Wats.; (4) Thimble Lily, *Lilium bolanderi* Wats.; (5) Yellow Lily, *Lilium parryi* Wats.; (6) Fairy Lily, *Lilium parvum* Kell.; (7) Glacierlily, *Erythronium parviflorum* Pursh.

white hairs, they march triumphantly from coast to desert and from Lower California to southern Oregon, taking possession of sandy soil and thriving with little encouragement. All thistles are weeds with the exception of the blessed thistle (*Carduus benedictus*), which furnishes a drug, and the artichoke (*Cynara scolymus*), which supplies the epicure with table delicacies. Many who enjoy the mound of thick olive-green leaves appearing as a salad are unaware of its position on the plant as a bud which will open up into a large head of blue thistle flowers if left in place.

Star Thistle (*Centaurea melitensis* L. Plate XXVIII, figure 2).—While a single plant of the star thistle may please by its resemblance to a branched candelabrum holding globes of yellow flame in vase-shaped involucres, it is just as well to admire from a distance, for too close contact reveals the presence of vicious spines that pierce and stab. From July to November they appropriate the fields and waysides of California and Arizona, being considered only a little less obnoxious than a close relative (*Centaurea solstitialis*), which has longer spines and takes extensive areas in northern and central California. Both are natives of Europe which have emigrated to this country and become completely naturalized in the far West.

CHICORY FAMILY

Cichoriaceae

Hypochaeris (*Hypochaeris radicata* L. Plate XXVIII, figure 3).—The plumy bristles attached to the seeds of hypochaeris carry far and wide, and some of those that found a lodging place in cargoes being put aboard freighters in European ports eventually reached New York and Philadelphia in ballast. From there they have journeyed by whatever means offered until, reaching the Pacific coast, they have made themselves very much at home in field and wayside. The flowers of hypochaeris closely resemble those of its near relative, the dandelion.

Malacothrix (*Malacothrix californica* DC. Plate XXVIII, figure 4).—The lovely heads of malacothrix are two inches in diameter, as a rule, and are composed of several hundred ribbonlike flowers crowded together into a fluffy rosette. When in bud, these heads hang like lemon-colored balls on curved stems. This species blooms from March to May, in open ground and sandy soil, from the Sacramento Valley to San Diego, and is especially common along the coast and in the interior valleys.

The hairs disappear as the plants grow older, and then they are scarcely to be distinguished from the form (*Malacothrix glabrata*) that is at home on the dry eastern portion of the Sierra Nevada, in California and Nevada, and as far east and south as Utah and Arizona.

Wild Lettuce (*Lactuca pulchella* DC. Plate XXVIII, figure 5).—Although the garden lettuce (*Lactuca sativa*) loses its attractive succulence as it goes to seed and the stalk of yellow flower heads emerges, its wild-flower sister is always charming, and its many flower heads with yellow centers and narrow blue-lavender rays make up for deficiencies in the way of edibility. The plants are found through open pine forests in the California and Nevada mountains or in the valley soil of the northern part of the country.

Agoseris (*Agoseris retrorsa* Gray. Plate XXVIII, figure 6).—Agoseris plainly shows its relationship to the dandelion in its yellow head of strap-shaped flowers and the similar appearance of the rosette of leaves at the base of the flower stalk.

The agoseris of our western plains has smooth green leaves, although the involucre beneath the large bright yellow head is often covered with white wool.

Chicory (*Cichorium intybus* L. Plate XXVIII, figure 7).—Many-pointed like radiant stars, cerulean blue like the sky, a galaxy of chicory blossoms transforms a lush green brook bank or grassy roadside into a strange, new firmament. Like so many of our common weeds, chicory has come over from Europe, and after gaining a foothold in Massachusetts, where it was brought from Holland in 1785, it spread far and wide.

Its long, deep, perennial taproot is roasted, powdered, and mixed with coffee or used in place of the latter, especially abroad. England imports as much as 5,000 tons a year, while as long ago as 1860 France was using 16 million pounds annually. During and since the World War its consumption has increased enormously, even in this country.

The garden endive (*Cichorium endivia*), with curly, peppery leaves, which are used in salads, is a chicory, while a somewhat more distant relative, the oyster-plant (*Tragopogon porrifolius*), furnishes a root with a flavor reminiscent of oysters instead of the fragrant coffee berry. For further details, see the National Geographic Society's publication, "The Book of Wild Flowers," page 88.

LILY FAMILY

Liliaceae

Firecracker Flower (*Brodiaea coccinea* Gray. Plate XXIX, figure 1).—As far as color and shape are concerned, a cluster of firecracker flowers attached to the main stem by slender pedicels looks so much like a bunch of small firecrackers fastened by their fuses that they might well furnish a perfectly safe and sane Fourth of July. It would be a pity, however, to bring these charming little wildings in from their haunts on grassy hillsides or in open forests, where their brilliant crimson blossoms serve a better purpose. An unusual color combination is afforded by the soft green of the corolla lobes encircling the creamy white petal-like stamens in the throat of the bright crimson tubes.

The firecracker flower finds itself at home in southern Oregon and northern California.

Ithuriel's Spear (*Brodiaea laxa* Benth. Plate XXIX, figure 2).—Fancifully likened to the spear borne by the angel Ithuriel, because of its

straight slimness of stem, this brodiaea joins its twin sister, the harvest brodiaea (*Brodiaea grandiflora*) in beautifying grasslands from early summer until the hay is ready for cutting. Both have large, beautiful, purple blossoms in loose clusters that are very showy. They are found commonly in fields, grassy hillsides, and open woodlands from central California northward through Oregon and Washington, where the bulbs are roasted and eaten by the Indians.

Blue Brodiaea (*Brodiaea capitata* Benth. Plate XXIX, figure 3).—The blue brodiaea is one of the best known and most widespread of the many beautiful California flowers blooming in the spring. It may be found everywhere abundant on clay slopes and hills of the coast districts and even climbing up into the pine belt of the Sierra Nevada and the Yosemite.

Owing to its frequence and wide distribution, the species furnishes many interesting variations in size, being but a few inches tall, with tiny flowers, where the soil is dry and hard, or stretching up to a height of several feet when growing in the shelter of shrubs in the chaparral. The lovely blossoms vary, even in the same cluster, from rose-lavender to blue-lavender and resemble hyacinths in form.

Golden Brodiaea (*Brodiaea ixioides* Wats. Plate XXIX, figure 4).—The six-pointed, star-shaped blossoms of the golden brodiaea form loose, open clusters on slender stems which may be but a few inches tall or shoot up to more than a foot in height. The flowers are bright yellow, veined with brown, and differ from golden stars (*Bloomeria aurea*), which they very closely resemble, in having anthers attached to broad filaments instead of slender, threadlike ones rising from a tiny cup. They may be looked for during the summer in the mountains from southern California to Oregon, often reaching an altitude of 8,500 feet.

Golden Stars (*Bloomeria aurea* Kell. Plate XXIX, figure 5).—The large, loose clusters of these narrow-petaled blossoms are placed so airily on slender, leafless stems as to look like showers of golden stars. This wild flower is not a mountain climber and will therefore be confused with the golden brodiaea only on the lower slopes, where it sprinkles the mesas and foothills of southern California with bright blossoms from April to June.

Nodding Onion (*Allium cernuum* Roth. Plate XXIX, figure 6).—This wild onion, with its pretty cluster of rose-lavender blossoms, gives no hint to the novice of its affinity with the familiar plant in the garden until the leaves are broken and the telltale odor reaches the nostrils.

The nodding onion thrives best in the cool air of the mountains of Oregon and northward as well as in the Rockies. In the Middle West the common wild onion (*Allium mutabile*) was abundant enough in the early days, before the prairie flora disappeared in front of advancing cultivation.

Purple Onion (*Allium fimbriatum* Wats. Plate XXIX, figure 7).—Of the thirty species of onion on the Pacific coast, this purple-flowered one stands out as one of the most attractive in appearance, the clusters of blossoms being unusually large and vividly colored.

The plants occupy stony slopes, especially in the chaparral belt of southern California toward the desert and away from the coast.

Butterfly-mariposa (*Calochortus venustus* Dougl. Plate XXX, figure 1).—Like a swarm of bright butterflies indeed are these mariposas, fluttering their gay banners under the caress of the breezes. Their petals wear many colors, from white to lilac and deep wine-red, marked with spots and blotches of contrasting tints. White-petaled forms with dark brown spot rimmed in pale yellow stand side by side with clear lavender ones blotched with maroon, or near dark purplish red ones marked with deeper shades and banded with yellow.

The pretty name of mariposa is the Spanish for butterfly.

Lilac Mariposa (*Calochortus splendens* Dougl. Plate XXX, figure 2).—Surrounded by waving grasses, the lilac mariposa bears aloft its rose-lavender chalice on a slender stem, or folds its delicate petals in the coolness of late afternoon or on a cloudy day. Within the lovely cup the six large, purplish blue stamens add a final touch of distinction to its fragile beauty.

Dry, gravelly hills of central and southern California, usually in the chaparral, offer this species a home, while another lilac-flowered mariposa (*Calochortus nuttalli*) is distributed more widely. It climbs the mountains into the Yosemite and higher or travels eastward through Arizona and Utah.

Yellow Mariposa (*Calochortus luteus* Dougl. Plate XXX, figure 3).—Though usually a clear yellow or deepening to orange, this mariposa may occasionally belie its name by becoming cream white or even adopting a violet tint. It is also capricious in the way it ornaments the petals with spots and blotches. These may be brown in the yellow forms, or maroon and crimson in the lilac ones, or various other combinations, all of which are pleasing to the eye.

When in flower, these golden lily-cups appear abundantly in dry or gravelly ground of the Coast Ranges and Sierra foothills of central California, although in the latter situations the varicolored forms are more frequent than the pure yellow ones.

Fairy Lantern (*Calochortus albus rubellus* Greene. Plate XXX, figure 4).—Exquisitely dainty, the shining globes of the fairy lantern seem to float in the air like iridescent soap bubbles, as the satiny white petals, flushed with old rose, curve to form globular blossoms drooping from slender stems. The pure white flowers of the species (*Calochortus albus*), which are the commoner, are set off by pale greenish sepals and a light green swollen gland at the base of the petals, while the variety illustrated is purple-tinged throughout, with veinings in deeper shades of the same lovely color.

The golden fairy lantern (*Calochortus pulchellus*) completes a charming trio with its

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IRIS FAMILY (*Iridaceae*): (1) Rainbow Iris, *Iris hartwegi* Baker; (2) Grass-iris, *Sisyrinchium bellum* Wats. ORCHID FAMILY (*Orchidaceae*): (3) Yellow Ladyslipper, *Cypripedium parviflorum* Salisb.; (4) Brook Orchid, *Epipactis gigantea* Dougl.; (5) Fairy Slipper, *Calypso borealis* Salisb.

pendant yellow globes. All three make their homes in central California, preferring open woods and shady slopes in the mountains.

Yellow Pussy-ears (*Calochortus monophyllus* Lem. Plate XXX, figure 5).—The fuzzy, pointed petals of this mariposa, with their alert erectness, are individually very suggestive of the sensitive, upstanding ears of a yellow kitten, and, when combined in threes with pale yellow sepals between, a most quaint and dainty blossom is the result. They are not at all common, but may be found here and there in the pine belt of the Sierra Nevada Mountains, blooming in the spring.

Mission Bells (*Fritillaria lanceolata* Pursh. Plate XXX, figure 6).—Bronze bells, mottled with purple and dull yellowish green, hang downward from bending stalks, and what looks like a clapper, fashioned to bring forth musical resonance, is but the pendant style cleft into three spreading lobes.

This species is found abundantly on coastal hillsides and in woodlands, from central California to British Columbia and eastward to western Idaho.

Purple Trillium (*Trillium sessile* L. Plate XXX, figure 7).—Wherever found—east, west, north, or south—in woodland or on hillside, the trilliums are among the earliest messengers of spring, so early, indeed, as to sometimes precede that early bird of spring, the robin, and win the name of wake-robin.

The purple trillium of California woodlands appears north of San Francisco and in Oregon as a greenish yellow or white form, while southward the three long, narrow petals, standing erect above the three large, spreading leaves, are richly rose-purple in coloring with darker veinings. The purple trillium (*Trillium erectum*) of the Northeast and East bears flowers of a similar color on a slender stalk above the three leaves, the petals curving backward with age. This is known as a carrion-flower, since the odor is extremely offensive, being designed to attract flies as pollen carriers and not to please the human olfactory nerve.

Tiger Lily (*Lilium humboldti* R. & L. Plate XXXI, figure 1).—A straight and tall eight-foot stem, hung with a score or more of large brilliant blossoms and whorls of lance-shaped leaves, marks the tiger lily as a stately and handsome plant. The many bright reddish orange flowers, gaily ornamented with dark purple spots, are strikingly beautiful, not only in coloring, but in form.

Although growing wild in canyons of the southern California mountains and dry open places in the northern portion of the Sierra Nevada, it responds to cultivation.

Leopard Lily (*Lilium pardalinum* Kell. Plate XXXI, figure 2).—The bright orange-red blossoms of the leopard lily nod on slender pedicels above the level of the surrounding vegetation, their exotic beauty seeming all the more striking by contrast with the dark green of the background. There may be as many as twenty-five flowers on a single plant, although the usual number is less. Its native haunts are in damp places in the mountains—shady stream banks and half-boggy meadows—from central California north to British Columbia, and it is a familiar sight along the Redwood Highway through northern California and Oregon.

Chaparral Lily (*Lilium rubescens* Wats. Plate XXXI, figure 3).—Not only do the lovely clusters of the chaparral lily show a charming range of color, from the white of unopened buds, through the coral-pink of full-blown flowers, to the reddish purple of the fading blossoms, but they exhale a fragrance that is not the least of their attractions. The Washington lily (*Lilium washingtonianum*) is very similar, the flowers being somewhat larger, pure white, turning purple with age, and very fragrant. Both grow in the chaparral the entire length of the Sierra Nevada as far north as the Columbia River.

Thimble Lily (*Lilium bolanderi* Wats. Plate XXXI, figure 4).—This unobtrusive little plant hides shyly in the mountains and, far from emulating its more gorgeous and arrogant sisters, dresses demurely in sober colors and modestly hangs its head. The flowers of any stalk may be few or many, horizontal or somewhat nodding, but they are all waxy-petaled, reddish purple in color, spotted with dark purple.

The plants are partial to plenty of moisture in the soil and inclined to take advantage of this in wet places about springs and in meadows, especially in the Siskiyou Mountains of southern Oregon and northern California.

Yellow Lily (*Lilium parryi* Wats. Plate XXXI, figure 5).—The stately plants of the yellow lily, hung with large lemon-tinted blossoms, are among the finest specimens of the group and, since they are quite easy to grow under cultivation, anyone with a garden may enjoy them at home if not abroad. The traveler, however, may see them frequently in moist places in the mountains of southern California, at the middle and upper altitudes, and especially abundantly in some parts of the San Bernardino and San Jacinto Mountains. The meadow lily (*Lilium canadense*) of low meadows in the eastern half of the country runs through a wider range of tint, from dark yellow to orange-yellow and even red, spotted within with brownish dots.

Fairy Lily (*Lilium parvum* Kell. Plate XXXI, figure 6).—The fairy lily makes up for the smallness of its blossoms by the height of its stem and number of flowers. Although often found but a foot or so tall and with two or three blossoms, it may shoot up to a height of six feet and produce thirty or more flowers at one time. These don a soberer tint than do many of its gayer relatives—a dull orange merging into vermilion, dotted with crimson or purple. Boggy places and moist stream banks in the Sierra Nevada, up to 7,000 feet, furnish favorable situations for natural growth.

Glacierlily (*Erythronium parviflorum* Pursh. Plate XXXI, figure 7).—Given early spring sunshine on mountain slopes and an abundance

of clear, cold water seeping from surrounding snow banks through porous soil and the glacier-lily will spring up by the thousand, carpeting the earth with smooth green leaves, which can scarcely be seen for the myriad bright yellow blossoms nodding above.

On the slopes of Mount Rainier, that paradise of flowers so carefully protected against vandalism, they combine with the white avalanchelily (*Erythronium montanum*) to turn the scene into fairyland. Although the glory of the mass soon passes, individuals may be found throughout the summer at higher and higher elevations where the late snows still linger.

IRIS FAMILY

Iridaceae

Rainbow Iris (*Iris hartwegi* Baker. Plate XXXII, figure 1).—The rainbow iris unfurls its lilac and yellow banners in spring and casts them aside one by one in the march toward summer and maturity. Open evergreen forests in the middle altitudes of the mountains, from the Siskiyous south through the Sierra Nevada, afford suitable growing conditions for this decorative plant. The flowers offer charming variety in coloring by combining a yellow body with lilac veining or a pale lilac background with veins of a darker shade and a yellow spot.

Grass-iris (*Sisyrinchium bellum* Wats. Plate XXXII, figure 2).—The purple six-pointed blossoms of the grass-iris transform hillsides into starry firmaments, as they open in the morning and close in the afternoon. Each lives but one short day, but is followed in such quick succession by another that it is difficult to believe the profusion of bloom each day is entirely new. The narrow, grasslike leaves grow in bunches of varying size and height, from a few inches in dry situations to two feet where conditions are favorable. The flowers exhibit a wide range of coloring, occasionally white, but usually some shade of blue or purple, from pale blue through all tints of lavender and lilac to dusky purple, each petal or sepal with a yellow spot at the base and a slender point at the tip, accentuating the starry effect.

The grass-iris of California is very like the smaller species (*Sisyrinchium angustifolium*) of the Middle West and eastward, which is more usually blue-flowered, but quickly recognized as closely related.

ORCHID FAMILY

Orchidaceae

Yellow Ladyslipper (*Cypripedium parviflorum* Salisb. Plate XXXII, figure 3).—Gleaming like golden balls in the dimness of northern woods or reflecting the dappled sunshine of aspen woodlands in the Rockies, the yellow ladyslipper is as rare as it is beautiful. The graceful stem and pretty leaves serve to set off effectively this odd flower with inflated yellow pouch and twisted streaming sepals of yellowish green and crimson.

Although the yellow ladyslipper is found on the coast in the far West only near Spokane, it occurs here and there in moist woods from British Columbia to Nova Scotia and south to Nebraska and Georgia, as well as in the Rockies.

Brook Orchid (*Epipactis gigantea* Dougl. Plate XXXII, figure 4).—The tall leafy stems of the brook orchid stand out gracefully against dark banks of moist earth, while toward the tip the row of little bronze and green blossoms, flushed with pink and with outspread sepals and hooded petals, look like tiny birds poised for flight. This species has none of the arrogant beauty of some of its exotic sisters, but is exquisitely dainty. Like most orchids, it is not very abundant, but may be found blooming in spring and early summer on the banks of streams or around springs along the coast and east to Montana and Texas.

Fairy Slipper (*Calypso borealis* Salisb. Plate XXXII, figure 5).—Dainty calypso hangs at the end of a rosy stem a single lovely rose-purple "slipper" quite evidently fashioned for a fairy's foot. The sepals and two of the petals form narrow twisted ribbons flaring upward at the back, while the "toe" is coquettishly ornamented with a yellow fuzz.

It is well that this fragrant little charmer hides away in inaccessible bogs and blooms early in moist woods in the mountains, for otherwise it would be thoughtlessly gathered and become more and more rare until completely exterminated. Like the ladyslipper, it prefers coolness to warmth and is found only in northern latitudes or at high altitudes. In bogs of Maine to Minnesota and northward as far as 68 degrees, in the mountains of Oregon, Washington, and Colorado, as well as in Europe, calypso is faithful to its name, which means "to conceal."

Notice of change of address of your NATIONAL GEOGRAPHIC MAGAZINE *should be received in the office of the National Geographic Society by the first of the month to affect the following month's issue. For instance, if you desire the address changed for your July number, the Society should be notified of your new address not later than June first.*

A hearty soup that never fails to tempt your appetite!

LOOK FOR THE
RED-AND-WHITE LABEL

SOUP

for the home luncheon

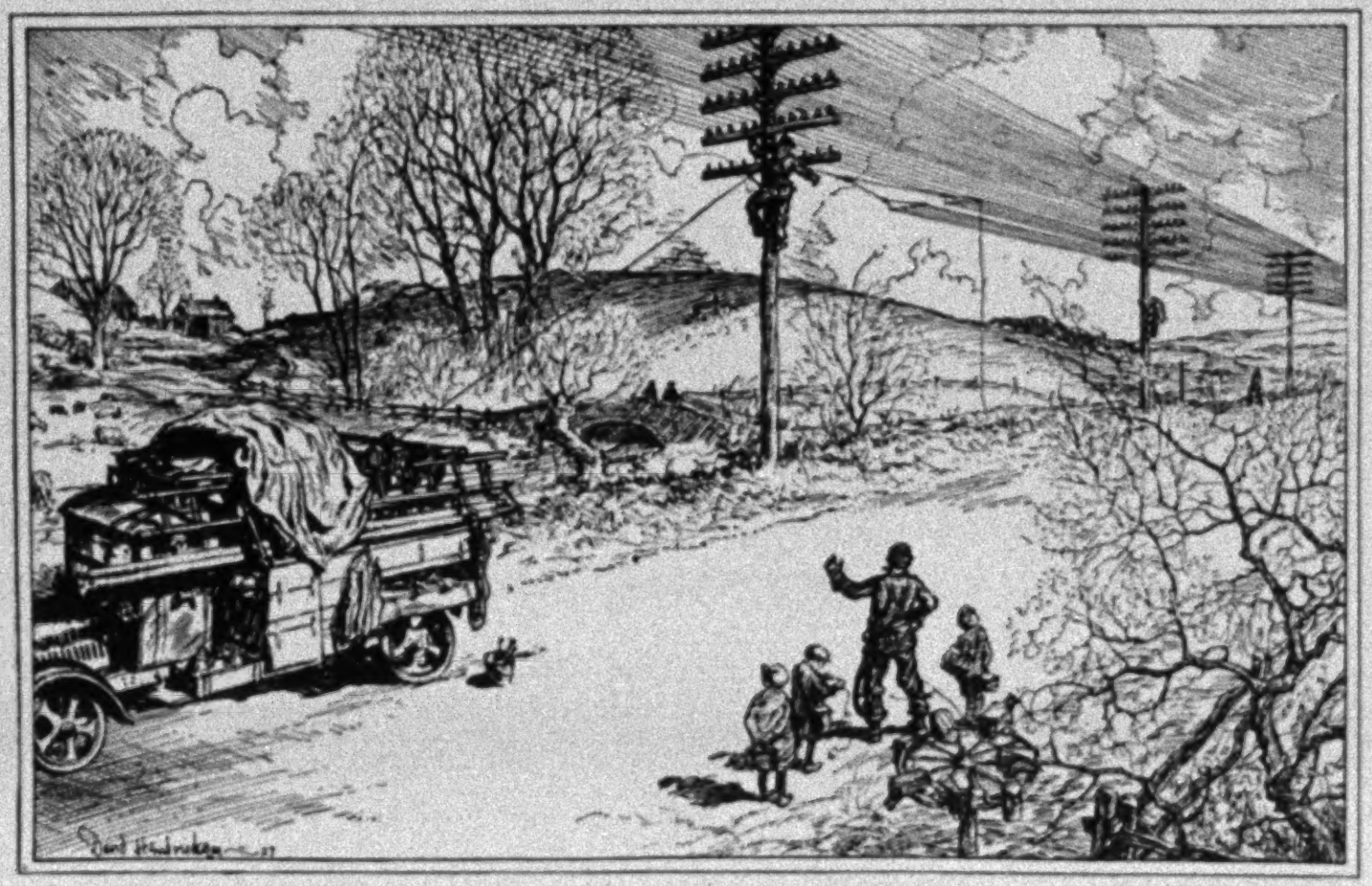
"WHAT shall we have for luncheon?" Thousands of housewives are daily faced with this troublesome and often vexing problem. Luncheon (and supper, too) are more in the nature of "off-meals," for which it is often difficult to know exactly the most appropriate food to serve.

SOUP—well-made, hot, nourishing, delicious soup—is the ideal answer to this problem. Do you realize why soup has sprung into such extraordinary popularity for luncheon and supper service, in addition to its regular place at the beginning of the longer meals? Quality, in the first place. The housewife knows that she can always trust the soup she buys at the store. She is familiar with the maker's name and label. And convenience! What a boon that is in the middle of a busy, hustling day—or at the end of it. The good soups she purchases are already blended and cooked by French chefs, with practically nothing left for her to do but serve them.

VEGETABLE SOUP is a favorite for luncheon or supper, with Vegetable-Beef, Beef, Ox Tail, Mock Turtle, Mulligatawny, Chicken, Chicken-Gumbo, Pepper Pot and Clam Chowder offering delightful variety. Tomato, Pea, Celery, Asparagus and Bean Soups are also attractive and popular midday and evening selections—especially nourishing served as Cream Soups, so easily prepared according to the simple directions on the labels. Supply yourself today.

12 CENTS A CAN

WITH THE MEAL OR AS A MEAL SOUP BELONGS IN THE DAILY DIET



Communication for a Growing Nation

An Advertisement of

the American Telephone and Telegraph Company

THE first telephone call was made from one room to another in the same building. The first advance in telephony made possible conversations from one point to another in the same town or community. The dream of the founders of the Bell Telephone System, however, was that through it, all the separate communities might some day be interconnected to form a nation-wide community.

Such a community for speech by telephone has now become a reality, and the year-by-year growth in the number of long distance telephone calls shows how rapidly it is developing. This super-neighborhood, extending from town to town and state to state, has grown as the means of communication have been provided to serve its business and social needs.

The growth is strikingly shown by the extension of long distance telephone facilities. In 1925, for additions to the long distance telephone lines, there was expended thirty-seven million dollars. In 1926 sixty-one million dollars. During 1927 and the three following years, extensions are planned on a still greater scale, including each year about two thousand miles of long distance cable. These millions will be expended on long distance telephone lines to meet the nation's growth and their use will help to further growth.

—*for adequate security*

YOU may be sure that the security back of every National City bond in your strong box is a known quantity, having been carefully measured by an organization with world-wide fact-gathering facilities, and 115 years of financial experience. Each issue appearing on our investment lists has passed rigid tests and is recommended as a good investment in its class. Our May circular furnishes a well diversified selection—it will be sent upon request.

The National City Company

National City Bank Building, New York

OFFICES IN 50 AMERICAN CITIES . INTERCONNECTED BY 11,000 MILES OF PRIVATE WIRES . INTERNATIONAL BRANCHES AND CONNECTIONS

Why razors seem sharper with this *saturated* lather

ANY razor seems sharper when the beard is as thoroughly softened as it should be. Williams Shaving Cream springs into a thick, bulky lather simply saturated with moisture. It is this extra moisture held by Williams lather that works wonders in beard softening. No half-cut hairs—no annoying razor "pull"—the razor just glides along.

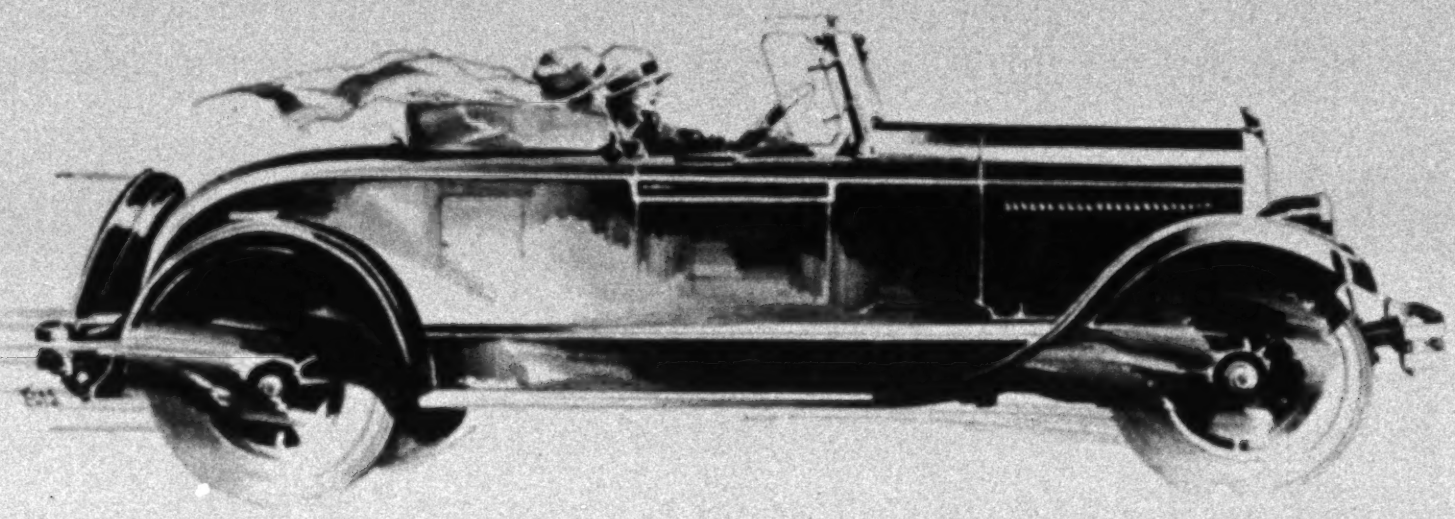
Williams lubricates the skin for easy shaving and gives your face that "barber's massage" feeling after the shave.

Send for a FREE trial tube containing enough cream for a week's comfortable shaves. Address: The J. B. Williams Co., Dept. 55, Glastonbury, Conn., U.S.A., or 1114 St. Patrick St., Montreal.

Williams
Shaving Cream

AQUA VELVA. *One new after-shaving liquid, keeps the face as comfortable as Williams Shaving Cream leaves it. Write Dept. 55 for generous test bottle.*

Un-matched results— why the public lifted Chrysler from 27th to 4th place



THE tide of public preference which has swept Chrysler from 27th to 4th place in three years, reaches full flood in the recognition of Chrysler "70" leadership.

The ever-widening circle of appreciation of its revolutionary results is everywhere accepted as positive evidence of how well the four great Chryslers—"50," "60," "70" and Imperial "80"—are designed and built.

Three years ago the first "70" upset all standards with its speed of 70 miles plus, its dash of 5 to 25 miles in 7¼ seconds and economy of 20 miles to the gallon.

With its scientifically-balanced, 7-bearing crankshaft it offered—for the first time at its price—greater smoothness and longer life. It afforded new ease of handling, extraordinary riding comfort and utmost safety. It initiated fresh smartness of body line and color blending.

Constant progressiveness maintains today's *finer* Chrysler "70" as far ahead of its field as its older self was on the day of its introduction.

D A S H

* * *

Sport Phaeton $1495; Two-passenger Roadster (with Rumble Seat) $1495; Brougham $1525; Two-passenger Coupe (with Rumble Seat) $1545; Royal Sedan $1595; Two-passenger Convertible Cabriolet (with Rumble Seat) $1745; Crown Sedan $1795 f. o. b. Detroit, subject to current Federal excise tax.

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All Chrysler cars are protected against theft under the Fedco System . . . Chrysler dealers are in position to extend the convenience of time payments. Ask about Chrysler's attractive plan.

CHRYSLER 70

CHRYSLER MODEL NUMBERS MEAN MILES PER HOUR

You may sight the Ciné-Kodak either at waist height or eye level—an exclusive feature.

A click of the switch on your Kodascope projector, and the picture you've made is on your screen.

You may sight the Ciné-Kodak either at eye level or waist height—an exclusive feature.

Ciné-Kodak

All the joy of picture making—plus the thrill of action. It is thus that Ciné-Kodak synchronizes with the times. It presents *life*, as it is—changeful, vibrant, full of motion and of emotion.

You press the button..we do the rest

Complete outfit, Ciné-Kodak B for picture taking, Kodascope C for projecting, and Screen, $140. The price of Ciné-Kodak film, amateur standard (16 mm.), in the yellow box, includes finishing. Write for booklet "Motion Pictures the Kodak Way."

Eastman Kodak Company, Rochester, N.Y., *The Kodak City*

The most advanced Engine in America - and the Simplest

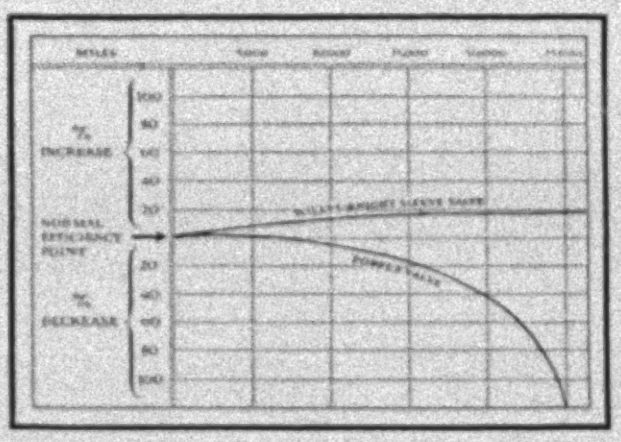
Smoother, quieter, more powerful—the engine improves with use

NEVER was the trend toward the "70" Willys-Knight Six more pronounced than it is today. At every Automobile Show—at all leading metropolitan centers throughout the country—this fine new car has won enthusiastic praise wherever it was shown. Already sales have climbed to new high peaks—and behind this record of success lie strong, substantial reasons.

Experienced motorists have learned that the "70" Willys-Knight engine develops more power for its size than any other type of stock production motor.

They have learned that in flexibility—acceleration—climbing power—economy—long life—and low depreciation—this car is without a rival.

Speed between 60 and 70 miles an hour. Lightning pickup—5 to 25 miles in 9½ seconds. Quick, positive stopping because of extra-powerful 4-wheel brakes.



This graph shows the estimated comparative efficiency of sleeve-valve and poppet-valve motors based upon average performance of both types. Note gradual rise of sleeve-valve engine efficiency curve up to and beyond the 75,000 mile mark and gradual decline to zero point of average poppet-valve engine at corresponding mileage.

New and finer body design. Lower, more graceful lines. True symmetry, perfect proportion. Roomier and more comfortable interiors.

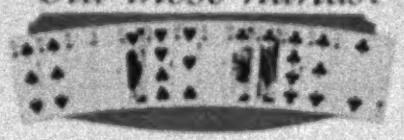
And in addition you will find in this car the following important advantages that add immeasurably to the pleasure, comfort and security of present-day motoring: Oil rectifier prevents crankcase dilution—Thermostatic temperature control—Belflex Shackles to reduce noise, improve riding qualities and silence chassis—Shock absorbers—Narrow corner posts—Automatic windshield wiper—Light controls at finger tips while holding wheel.

, , ,

"70" Willys-Knight Six prices from $1295 to $1495. Willys-Knight Great Six, from $1850 to $2295—f. o. b. factory. Prices and specifications subject to change without notice . . . Willys-Overland Dealers offer convenient terms . . . Willys-Overland, Inc., Toledo, Ohio. Willys-Overland Sales Co., Ltd., Toronto, Canada.

"70" WILLYS-KNIGHT SIX

How would you bid these hands?



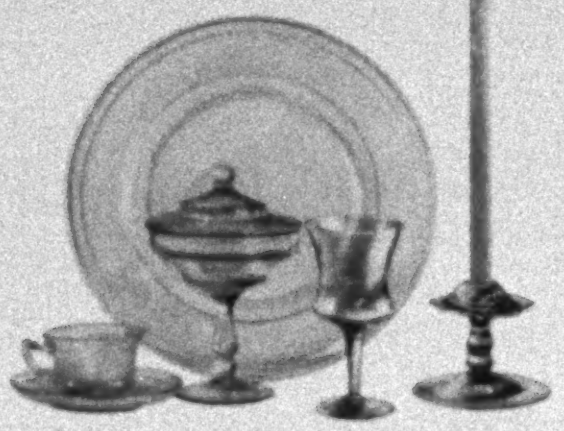
(YOU ARE THE DEALER)

Hand No. 7	*Hand No. 10*
♠ 8-6-3	♠ A-K-Q-J-9-5-2
♡ A-K-9-8	♡ 6
◇ None	◇ J-3
♣ A-K-J-9-6-2	♣ A-Q-2

Hand No. 8	*Hand No. 11*
♠ A-K-Q-J	♠ 6
♡ A	♡ A-K-Q-J-9-5-2
◇ Q-J-10-8-7-5-3	◇ A-Q-2
♣ A	♣ J-3

Hand No. 9	*Hand No. 12*
♠ None	♠ A-K-Q-10-4-2
♡ A-K-9-8-6-3	♡ K-10-9-7
◇ A-K-Q-4-3-2	◇ A-K-10
♣ K	♣ None

These six hands, the second set in a series of bidding problems, were arranged by Milton C. Work. Send *one* bid for each hand before July 1st. Correct bids for all hands win valuable prizes. Other problems will follow in later issues. Grand prize to winner of series. Address "Heisey's Bridge Contest." Details and Mr. Work's answers on request



There's Matchless Charm in Glassware

Enchanting pieces for every use—from bouillon to dessert and coffee—and for every occasion, from dinner or luncheon to bridge tea, are exquisitely wrought by Heisey. There are patterns and designs in infinite variety—and colors delightful to behold.

You may have the soft rose glow of Flamingo, or the delicate amethyst tint of Hawthorn, or the cool green of Moon Gleam, besides shimmering crystal—glinting like diamonds in the light.

Over the smartest tables this fine glassware casts its spell of charm. There are colors to gratify the most intimate whim of color arrangement. And always remember that glassware is in vogue today: *fashion demands fine glassware for the table.*

Ask your store to show you Heisey's Glassware. The (H) trade mark is the sign of the genuine. And if you wish to choose ideal gifts for any occasion, write for our new booklet, "Gifts of Glassware."

A. H. HEISEY & COMPANY
Newark, Ohio

HEISEY'S
GLASSWARE (H) *for your Table*

Resinol Soap wins professional favor

The effect of its Resinol properties brings warm praise from nurses

CRISP, immaculate, clear-skinned and wholesome, trained nurses are quick to recognize real merit in a toilet requisite and to adopt its use when they find it produces comfort or other beneficial results. Resinol Soap has won their endorsement through its distinctive Resinol properties.

They realize at once that these Resinol ingredients make the luxuriant lather soothing as well as cleansing and help to keep the skin soft and natural. They freely express their satisfaction, and in their letters are such statements as:

"Has always been my preference because it has such a soothing feeling on the skin."

"Am delighted with the wonderful lather, and appreciate its healing qualities."

"I recommend it to those who are seeking a smooth, natural complexion."

"Use it for my patients because it is so refreshing."

"As a cleansing agent, I like it very much."

Why not follow the example of these nurses and begin today to use Resinol Soap. Your druggist sells it. Of course we will be glad to send a trial size cake, free, if you will mail us the coupon below, but a full size cake gives a more satisfactory test.

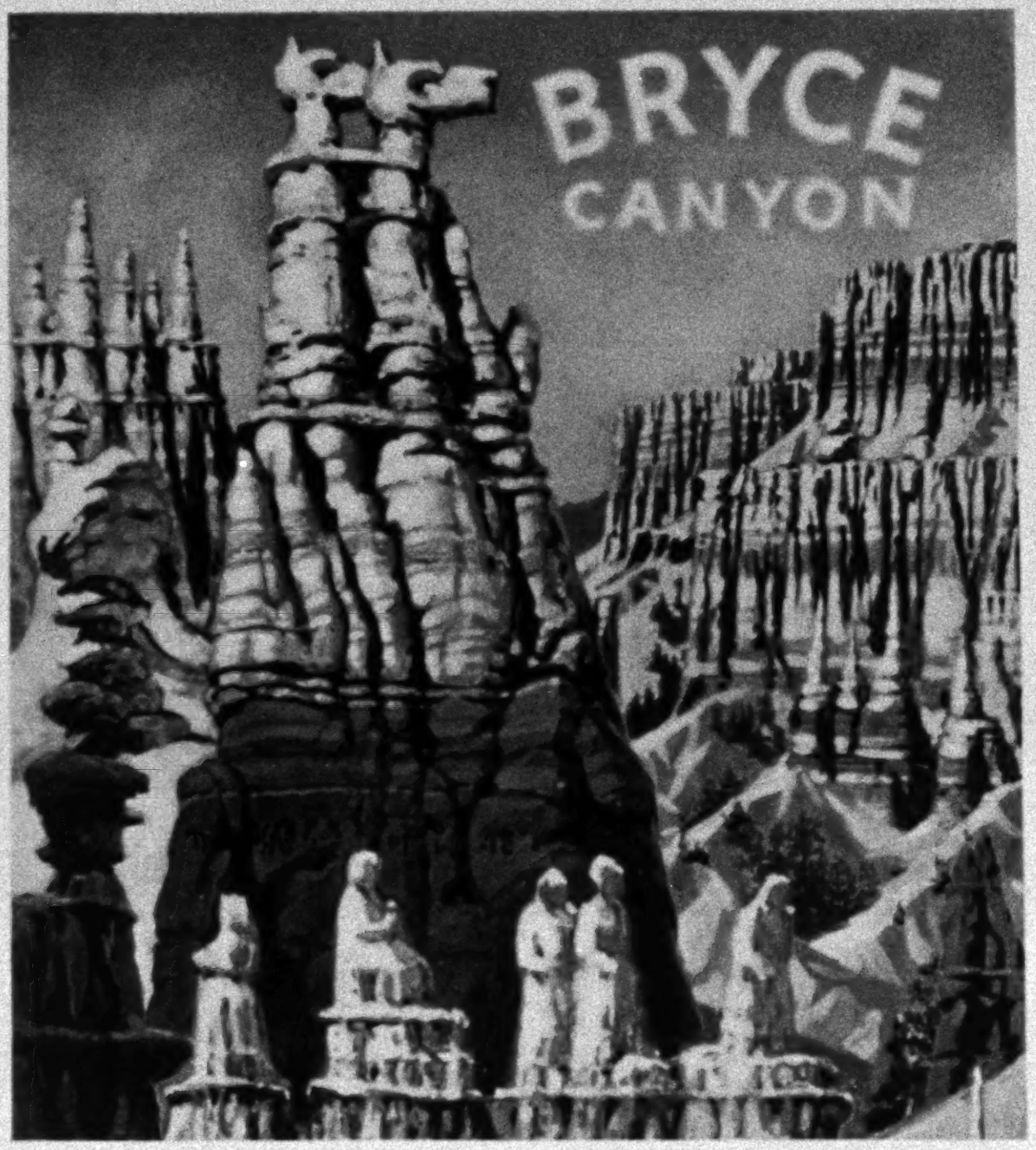
DEPT. 16-D, RESINOL, BALTIMORE, MD.

I have never used Resinol Soap, so please send me a free trial size cake.

Name .....

Street .....

City ..... State .....



Colorful ·· Colossal ·· Sublime

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Zion National Park—Kaibab Forest—Cedar Breaks

Season June 1 to October 1

In Bryce Canyon are immense chasms filled with realistic rock forms resembling ruined Oriental cities and castles and cathedrals of the Middle Ages, and with statues of men and beasts, all glowing with many colors. This region also includes tremendous colored canyons, colossal buttes, prismatic plains, vast virgin forests, wild horses, countless deer, mysterious cliff dwellings. See them all this summer. Easy to reach. Low summer fares. Through Pullmans to Cedar City, Utah, thence 3, 4 or 5-day all-expense motor-bus tours; also escorted tours. Comfortable lodges. Miles of scenic trails. A memorable vacation itself or a side trip en route to Yellowstone or the Pacific Coast. *The Zion—Grand Canyon Red Book tells all, free for the asking.*

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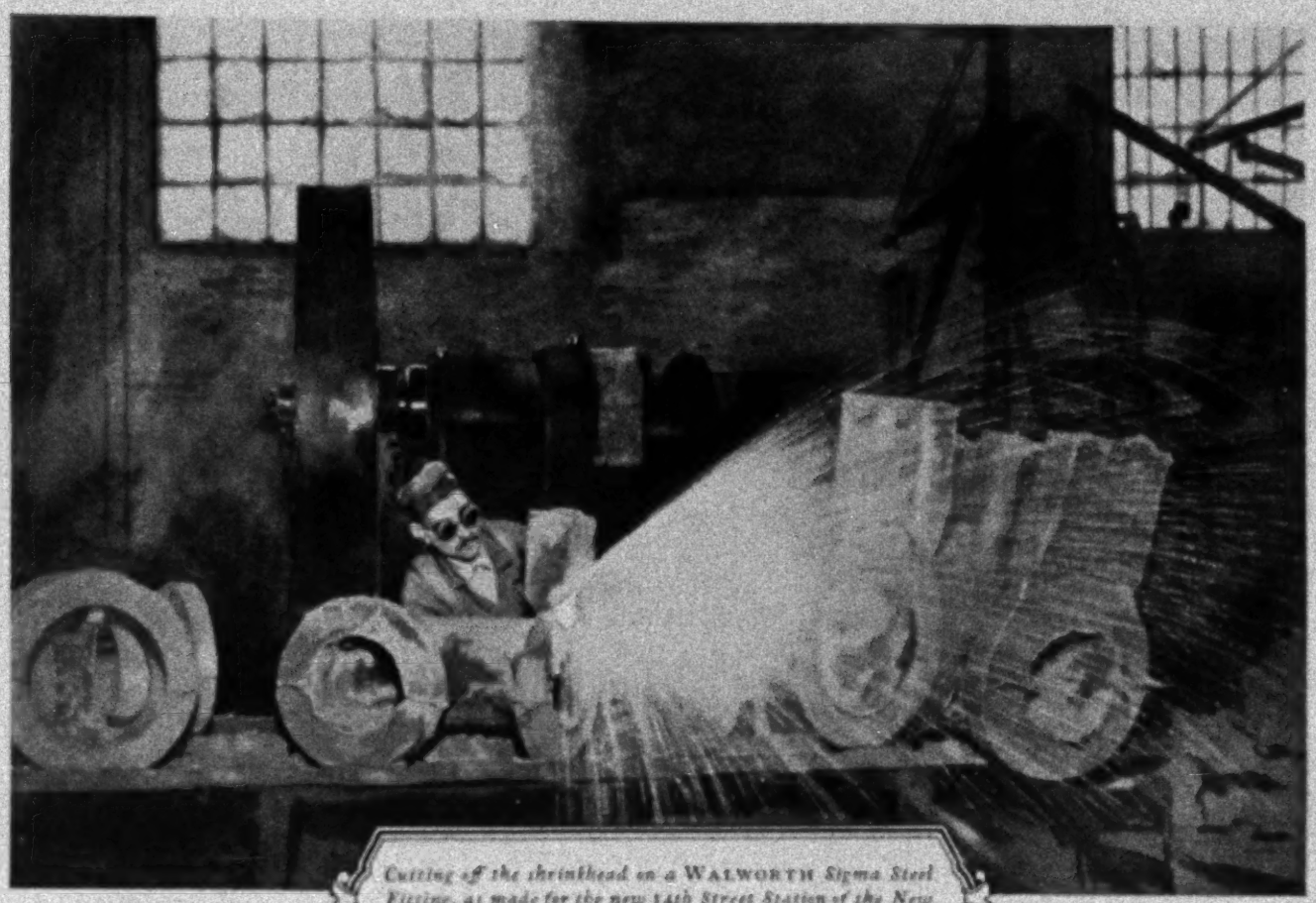
UNION PACIFIC

THE OVERLAND ROUTE



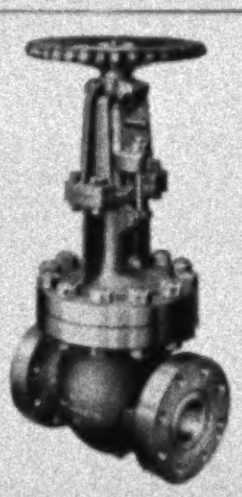
Cutting off the shrinkhead on a WALWORTH *Sigma Steel Fitting, as made for the new 14th Street Station of the New York Edison Company—the largest power plant in the world*

Eighty years after the first valve comes Walworth Sigma Steel

WHEN WALWORTH planned and installed the world's first steam heating apparatus there was no suitable means of control. The heat ran unregulated through a sizzling pipe in every room. When it got too hot there was nothing to do but open the doors and windows.

In 1846 WALWORTH devised a globe valve which could be turned off without the risk that the boiler would be blown out through the roof. The commonest type of valve in use today is almost identical with this first WALWORTH pattern.

For eighty years since then WALWORTH has maintained its position of leadership. The recent development of superheated steam, for instance, put a tremendous responsibility on valves and fittings, which neither iron nor brass could meet. Even steel was under suspicion.



Series 400 WALWORTH *Sigma Steel Gate Valve, Class AA, for use under extreme pressure and temperature conditions.*

WALWORTH engineers, therefore, adopted the X-ray as a means of research and after thousands of tests and experiments, finally evolved a new technique of casting steel.

This WALWORTH *Sigma Steel* is now recognized as establishing a new standard in the elimination of flaws and interior defects from steel castings.

Whatever You Build You Need Walworth

There is a safe, economical, and thoroughly tested line of WALWORTH valves and fittings for nearly every industrial and domestic use.

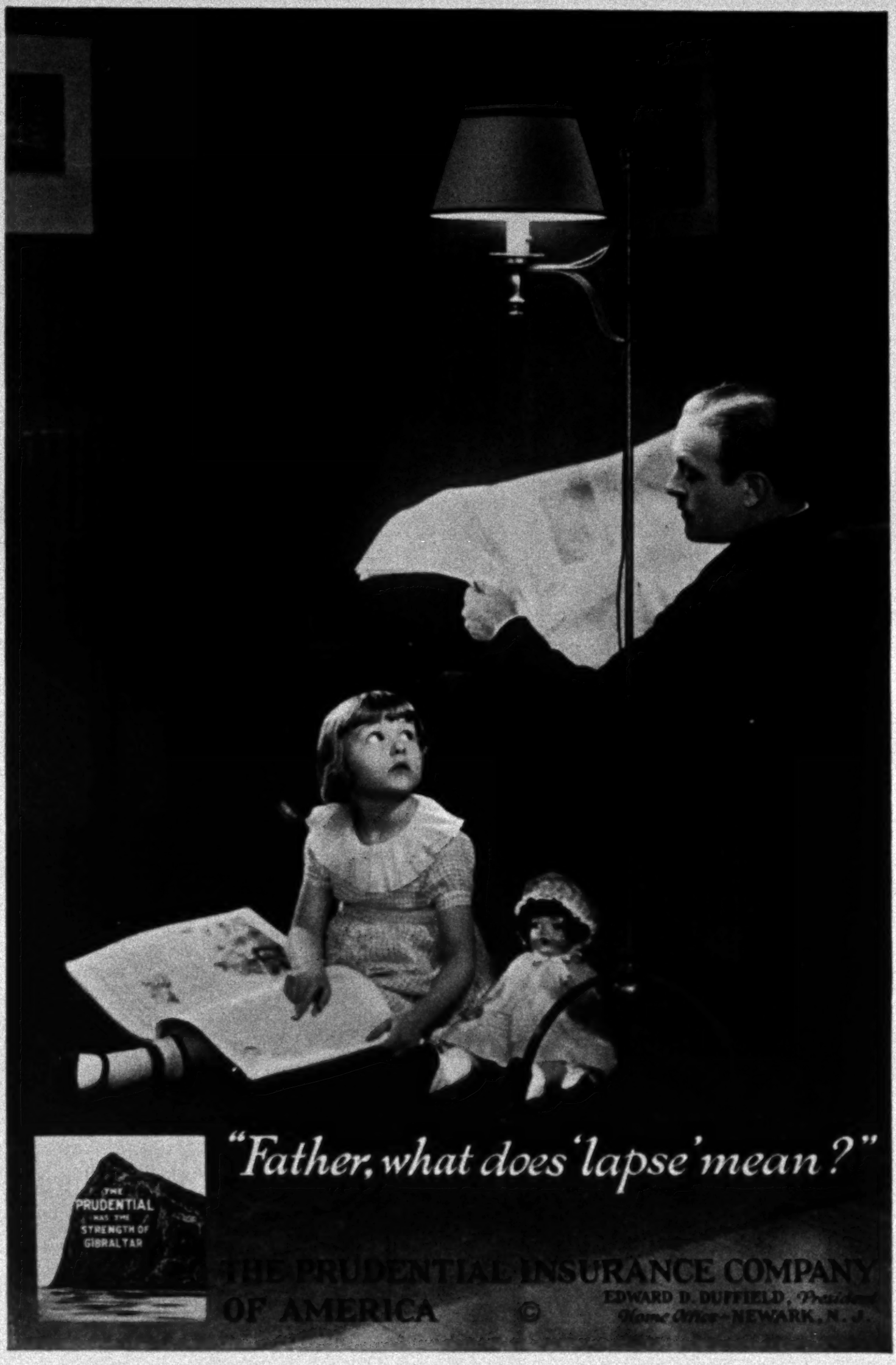
Whether your building project involves only a few low-pressure valves and fittings or a train load of Sigma Steel, it will pay you to be definite and emphatic in specifying "WALWORTH" to your architect, contractor, or engineer.

WALWORTH

VALVES, FITTINGS AND TOOLS

for STEAM, WATER, GAS, OIL AND AIR

WALWORTH CO. 51 East 42nd Street, New York ~ ~ Distributors in Principal Cities of the World


"Father, what does 'lapse' mean?"
THE PRUDENTIAL HAS THE STRENGTH OF GIBRALTAR
THE PRUDENTIAL INSURANCE COMPANY OF AMERICA
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EDWARD D. DUFFIELD, President
Home Office - NEWARK, N. J.

Cleanse

TEETH of Dingy Film

To Brighten Smiles Quickly

Send Coupon for 10-Day Tube Free

The art of smiling charmingly is the art of caring properly for one's teeth. Thus Pepsodent is placed near the top of the list of modern beauty aids.

A method dentists now are widely urging

WHEN teeth lack gleam and whiteness, usually they are film coated.

Run your tongue across your teeth, and you will feel this film—a viscous, slippery coating which ordinary brushing fails to remove successfully.

Now a new way in tooth cleansing, different in formula and effect, is embodied in the special film-removing dentifrice called Pepsodent.

Film absorbs discolorations from food, smoking, etc. That is why, according to leading dental opinion, teeth look dingy and "off color."

Film clings to teeth, gets into crevices and stays. It invites and breeds the germs of decay. And that is why it is judged so grave a danger by authorities.

Film is the basis of tartar. And tartar, with germs, is the chief cause of pyorrhea. That is why regular film removal is urged as probably first in correct gum protection.

Most dental authorities urgently advise thorough film removal at least twice each day. That is, every morning and every night.

For that purpose, obtain Pepsodent, the special film-removing dentifrice which leading dental authorities favor.

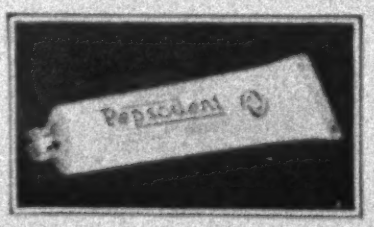
Pepsodent curdles the film, then removes it; then polishes the teeth in gentle safety to enamel. It combats the acids of decay and scientifically firms the gums. It multiplies the alkalinity of the saliva. And meets, thus, in all ways, the exactments of modern dental science.

Please Accept Pepsodent Test

Send coupon for a 10-day tube. Brush teeth this way for 10 days. Note how thoroughly film is removed—how teeth lighten as film coats go.

The habit of removing film twice daily from the teeth by Pepsodent is widely urged by dental authorities

FREE—10-DAY TUBE



FREE — Mail coupon for 10-day tube to The Pepsodent Company, Dept. 1066, 1104 S. Wabash Ave., Chicago, Ill., U. S. A. Only one tube to a family.

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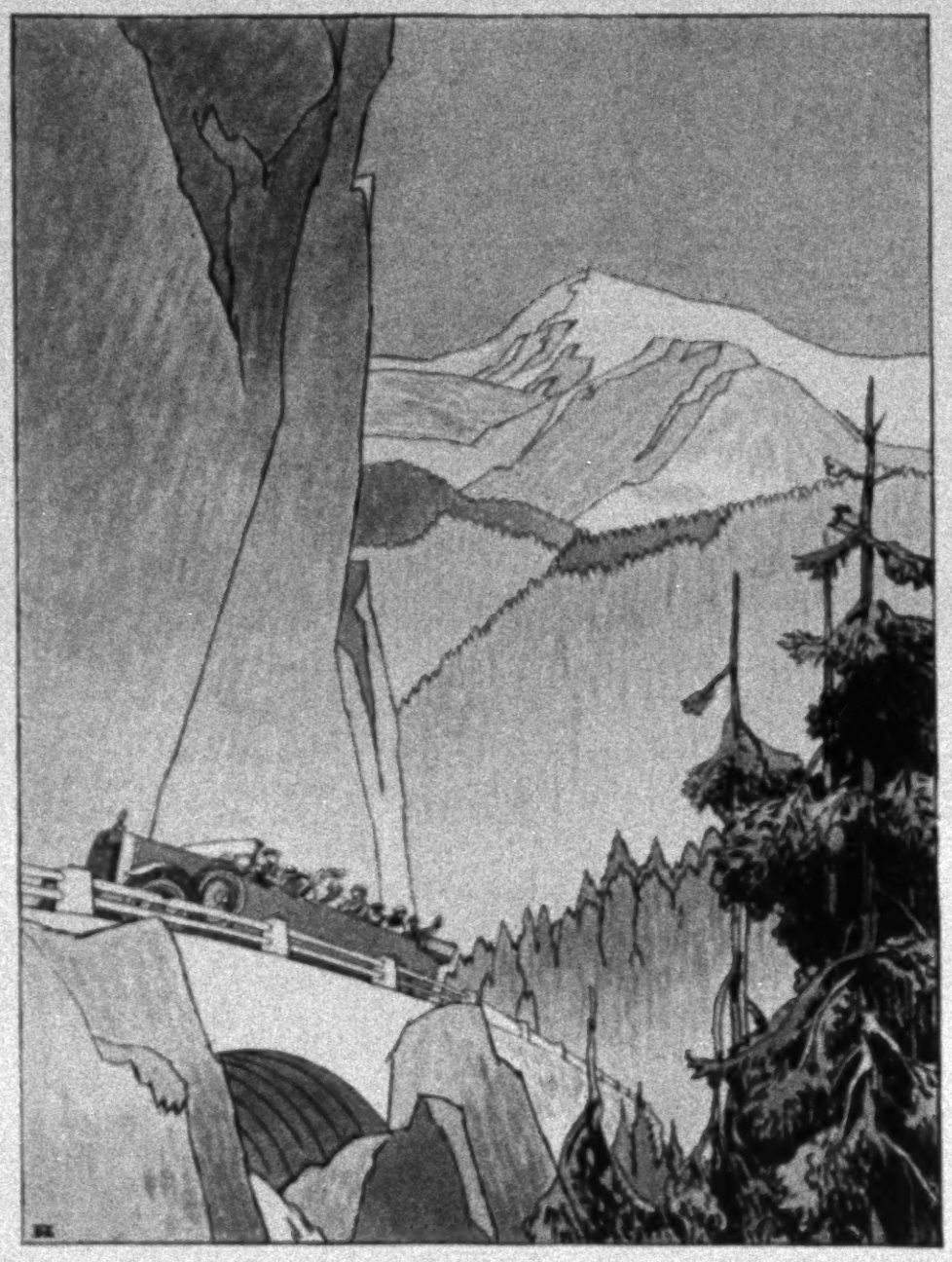
Take the world-famous *Olympian* or the *Columbian* over the transcontinental Milwaukee Road direct to Gallatin Gateway! There at the new Gallatin Gateway Inn you will find excellent hotel accommodations. Comfortable motors of the Yellowstone Park Transportation Company will carry you, with hardly a change of gears, directly to Old Faithful and the geysers, through gloriously fresh country of startling beauty. Through the rich Gallatin Valley, hemmed in by the Madison and Gallatin mountain ranges—cathedral-like peaks rising over 11,000 feet. Over the trail of the Covered Wagon. Up the rugged Canyon of the Gallatin River to an elevation of 7000 feet. And into Yellowstone Park.



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This year will be the first full season of travel through Gallatin Gateway to Yellowstone. We invite you to enjoy a pre-view of these newly discovered wonders—to have the satisfaction of being one of the first journeyers through Yellowstone's newest gateway.

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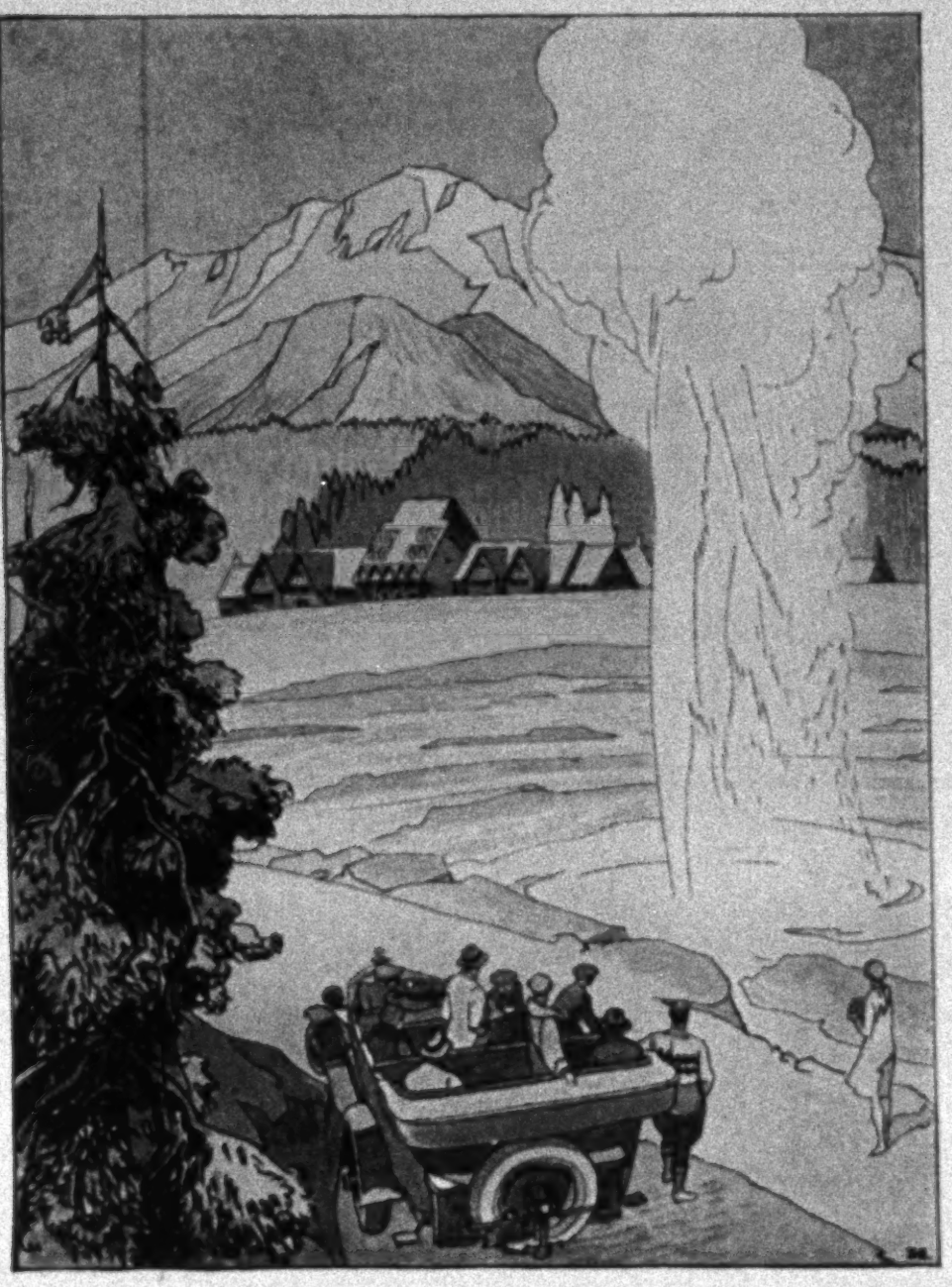

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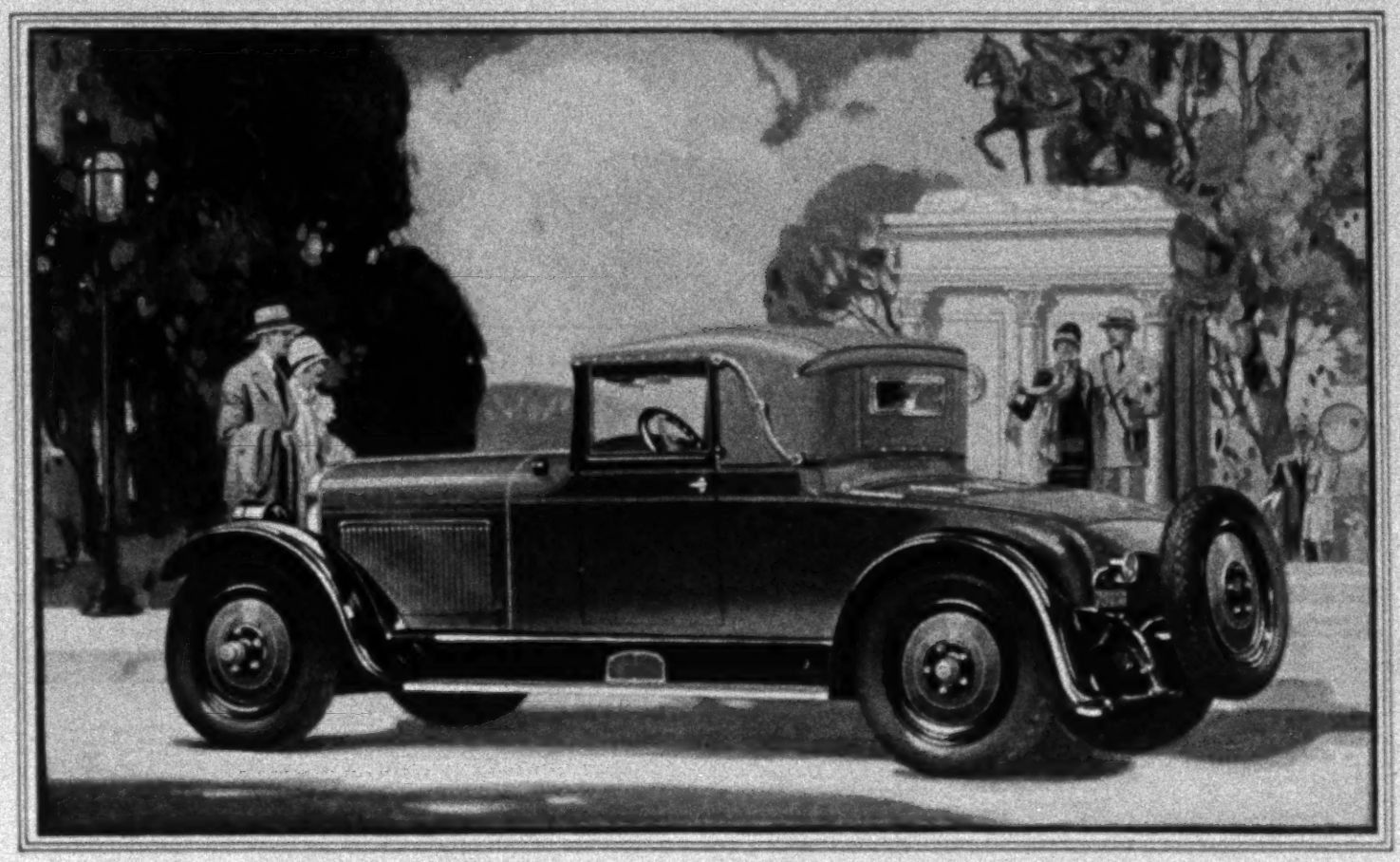

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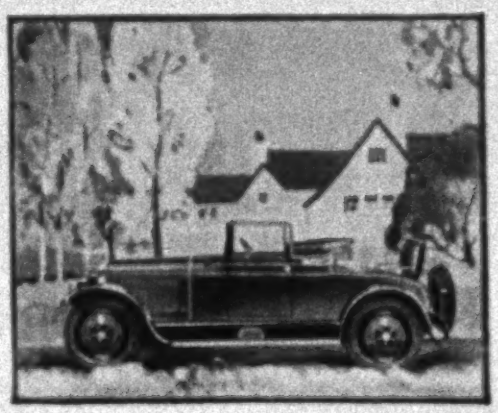
with Rumble seat



The wide glass windows may be lowered or raised with the top up or down. The steering wheel is of real walnut and the beautiful inlaid instrument panel is of walnut finish.

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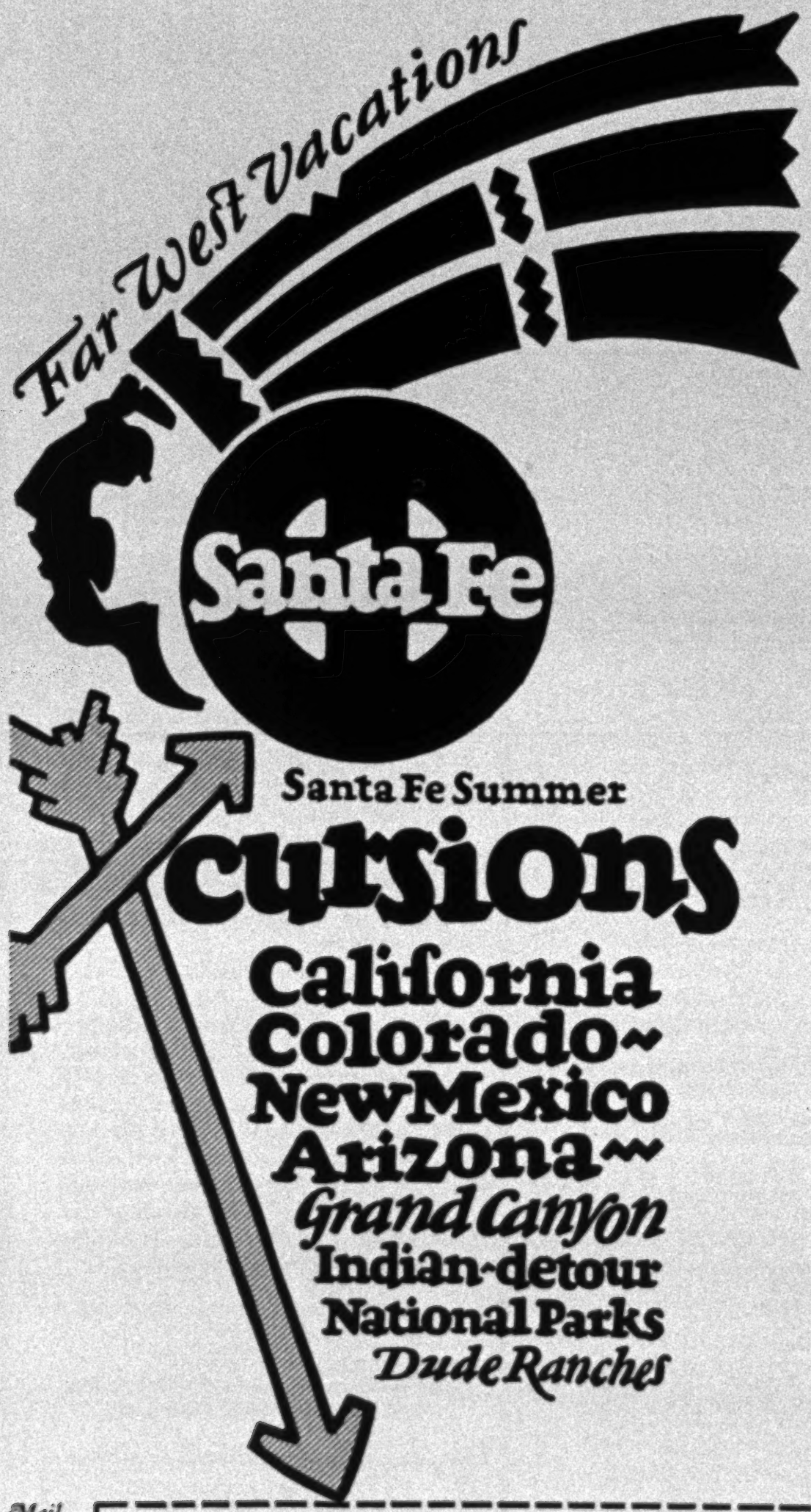
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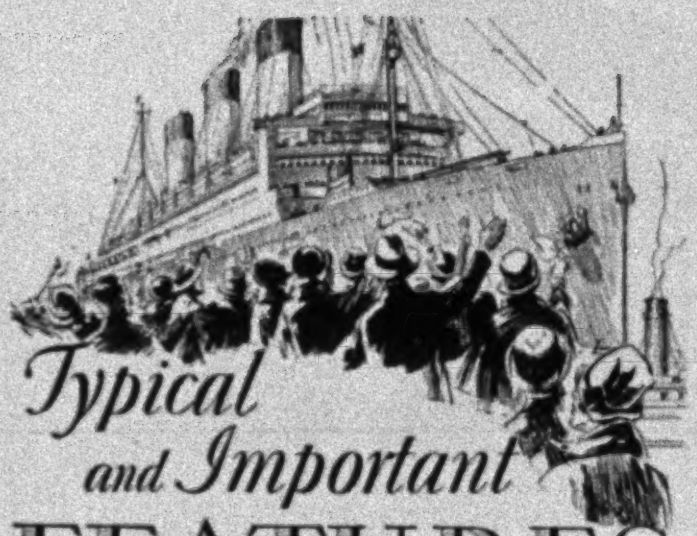

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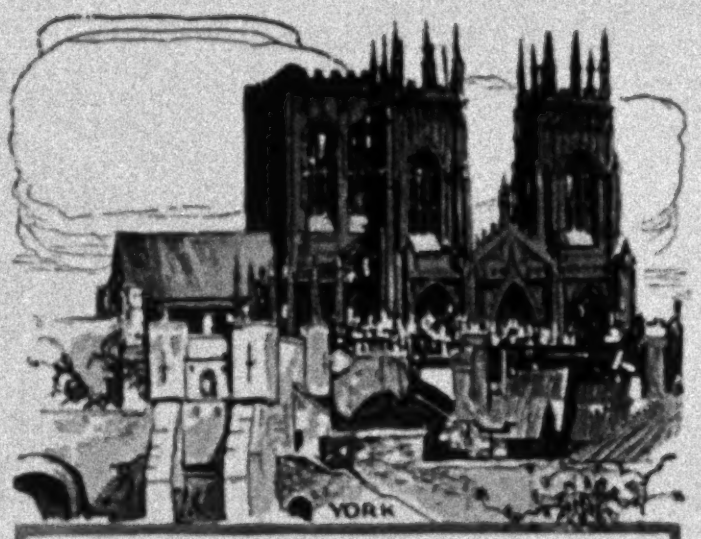

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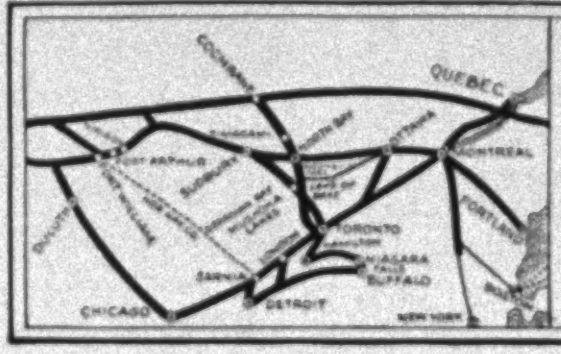

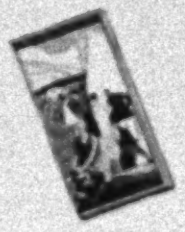

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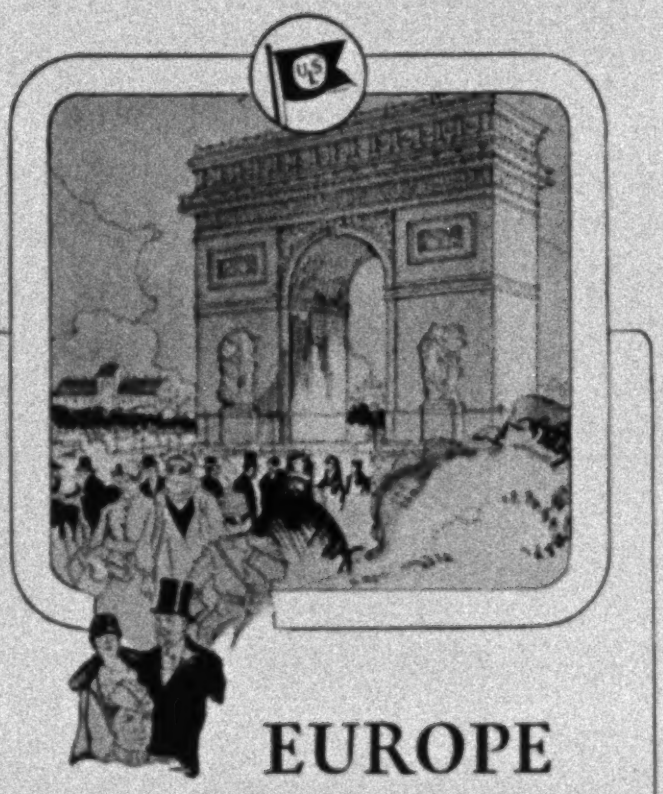

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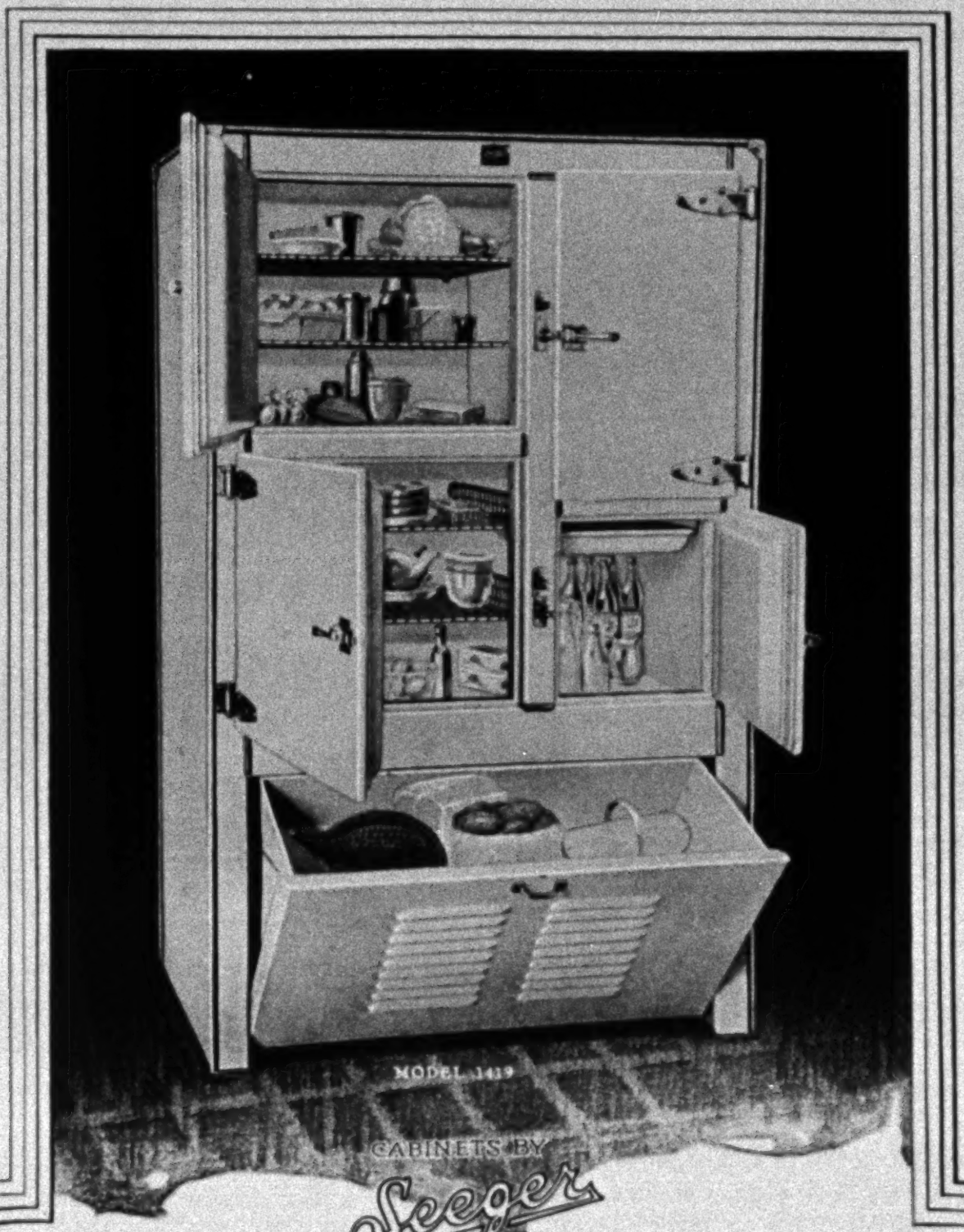

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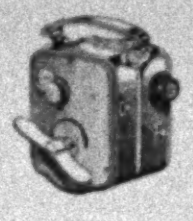

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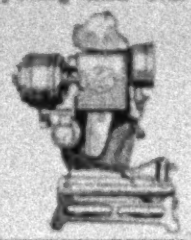

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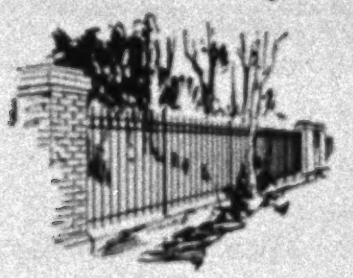

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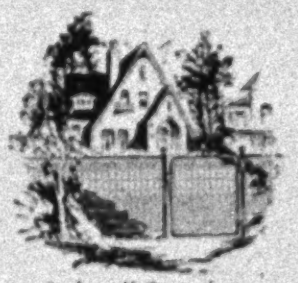

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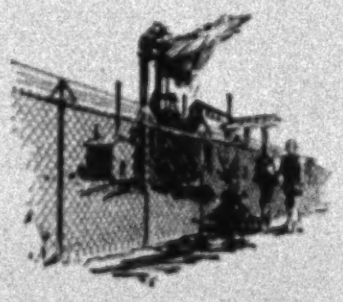

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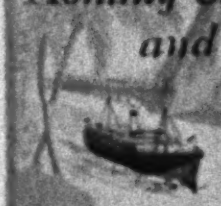

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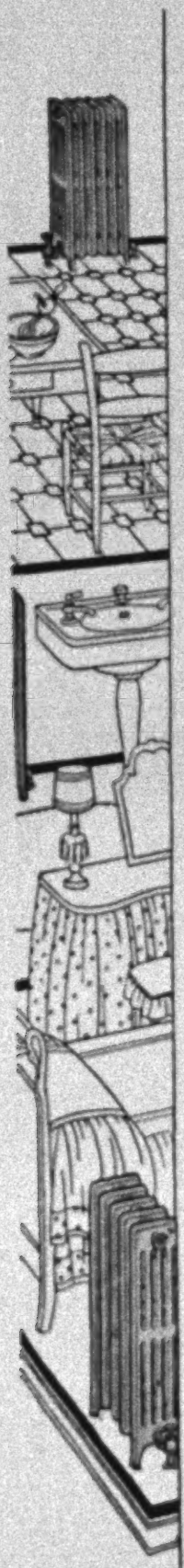

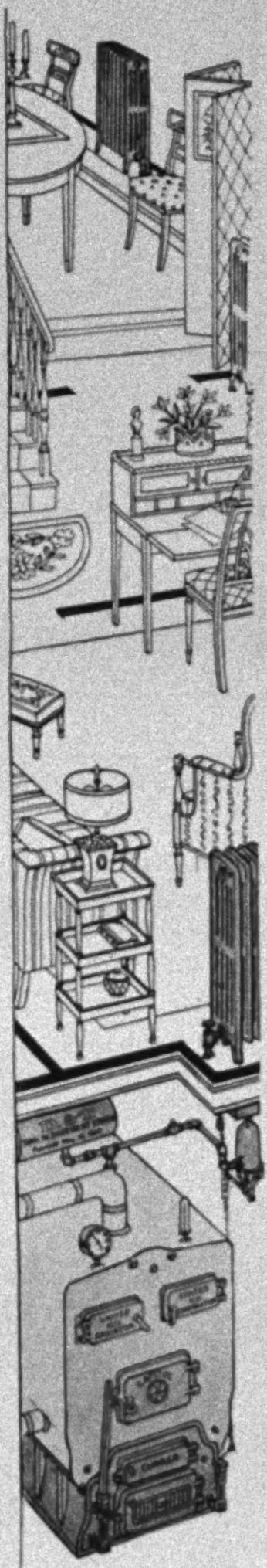

Advice for June Brides

This human desire to have a home of your own, a little piece of land, grass, flowers, and shrubbery.... Some day, with scant ceremony an unconcerned workman will turn the first spadeful of earth as you stand excitedly by . . . another anniversary to remember, the day your own home was begun.

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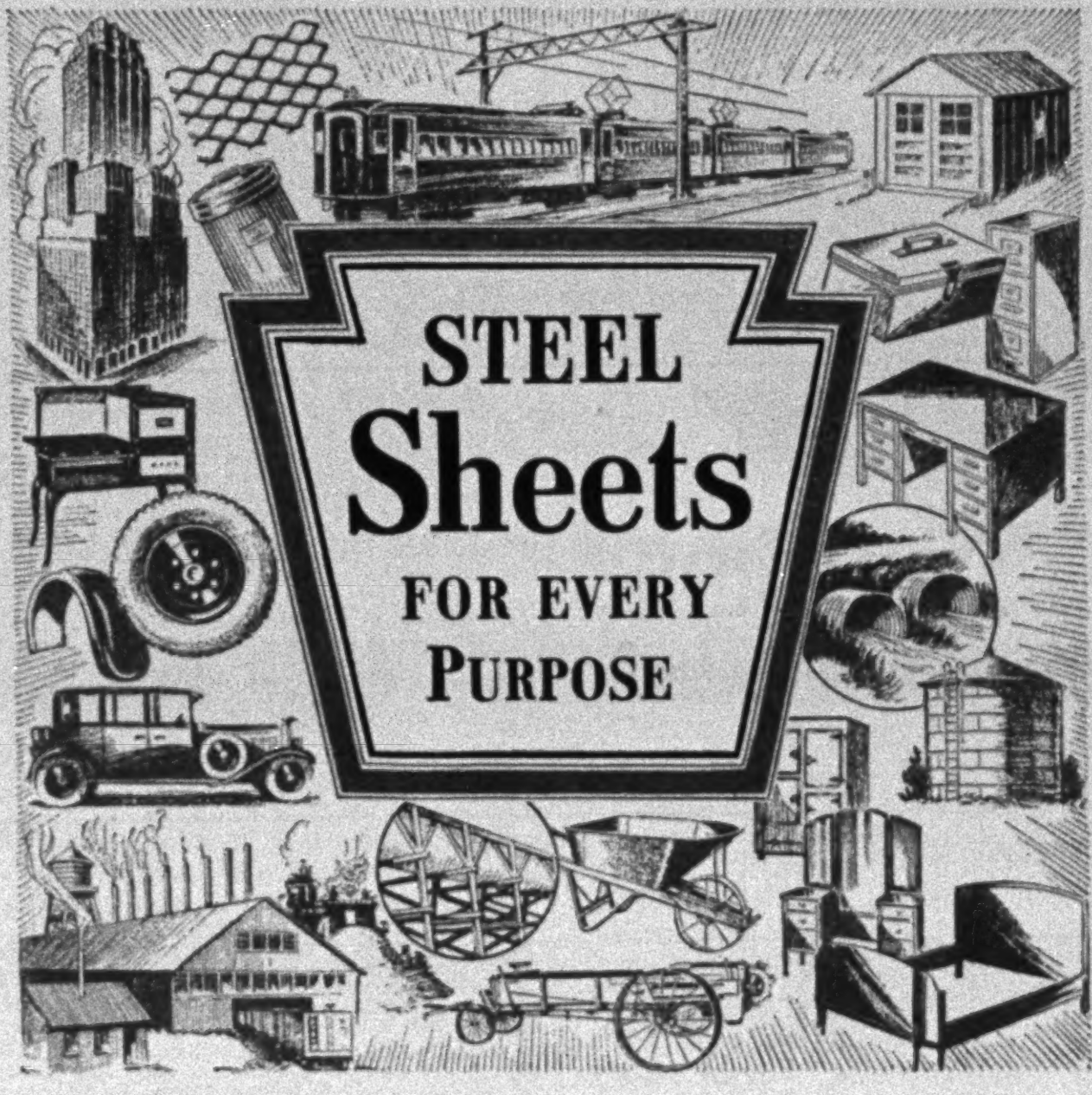

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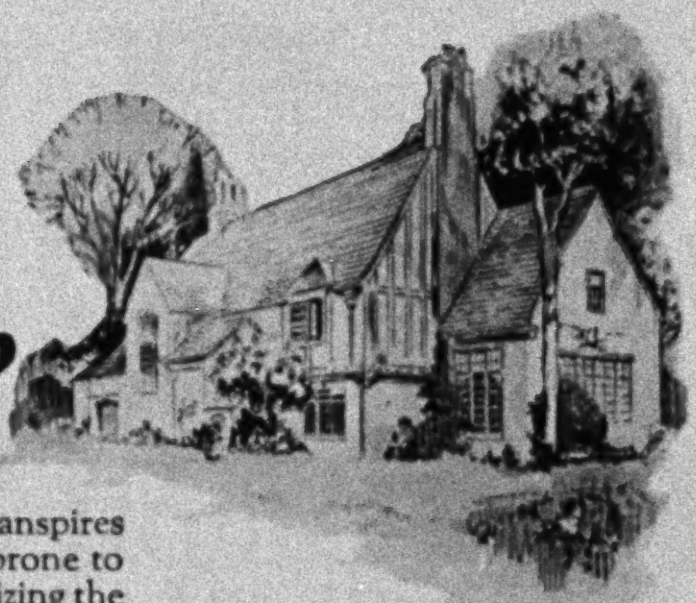

THE substitution evil generally transpires with the owner's consent. He is prone to good-naturedly permit it without realizing the consequence to himself. Does he benefit in proportion to the substitute proposer? Naturally, he seldom does. Contractors propose substitutions only when the benefit is theirs.

The Architect on the next building in which you are interested will probably specify Te-pe-co All-Clay Plumbing Fixtures. They represent the standard of excellence in such material. Certainly none better exist. Te-pe-co products represent a harmonious combination of the practical with the utmost of lasting beauty. They offer the latest advances in scientific sanitation. There are expensive Te-pe-co fixtures and those moderately priced but each is identical in quality of materials, workmanship and finish.

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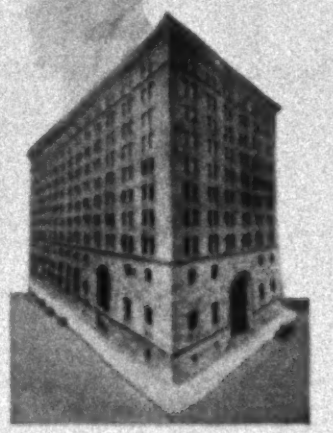

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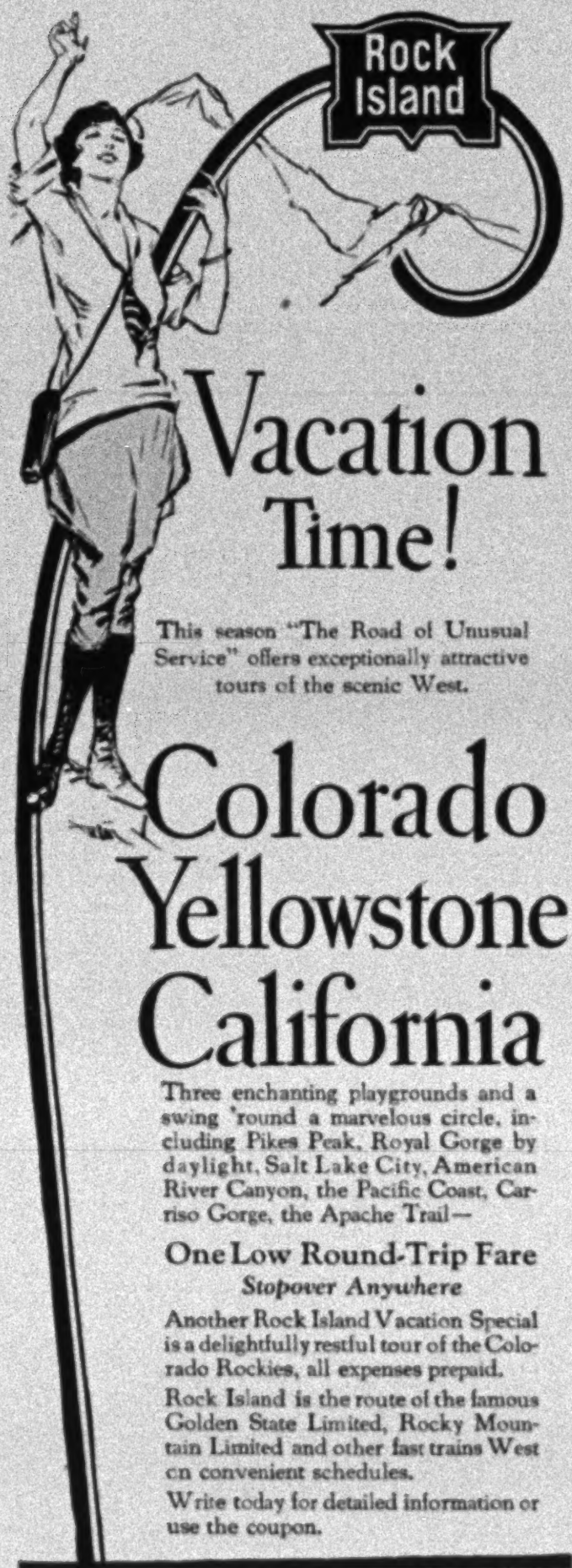

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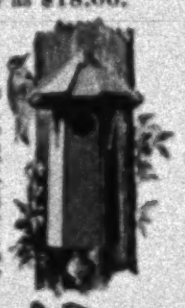

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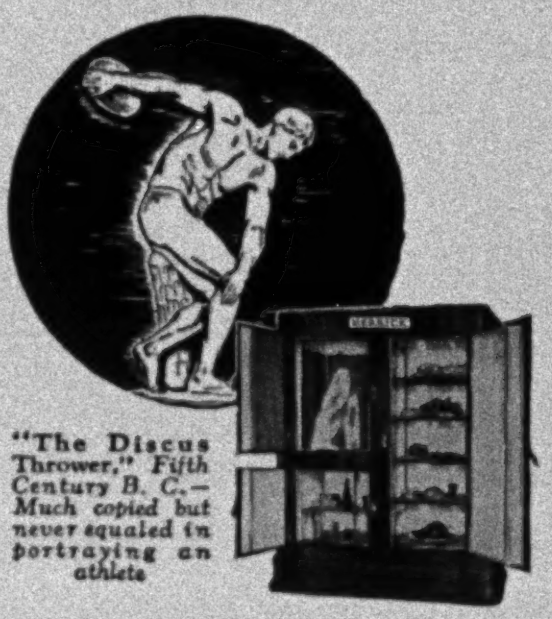

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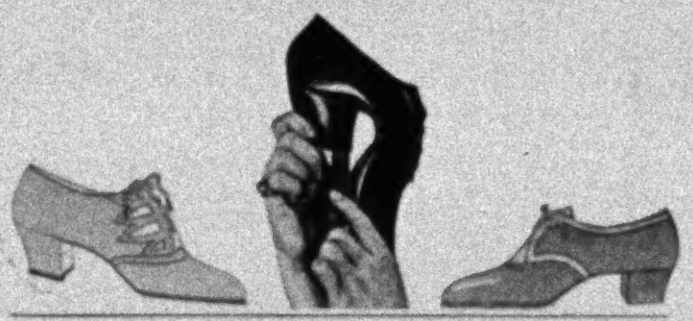

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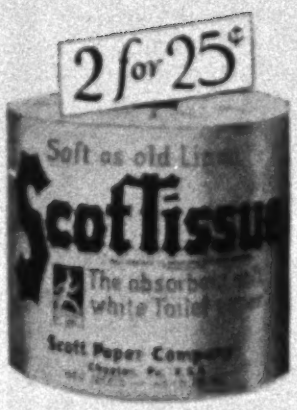

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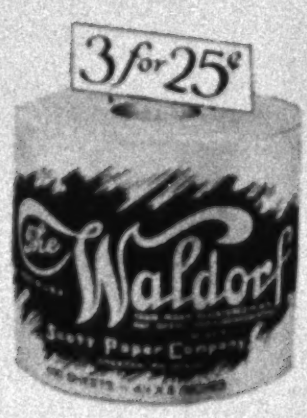

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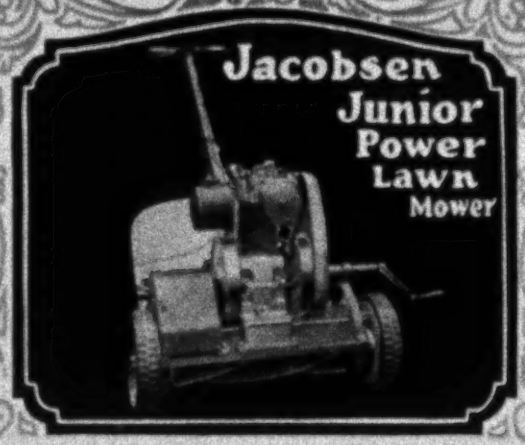

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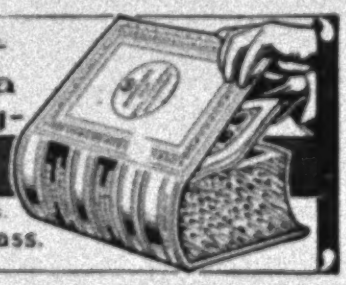

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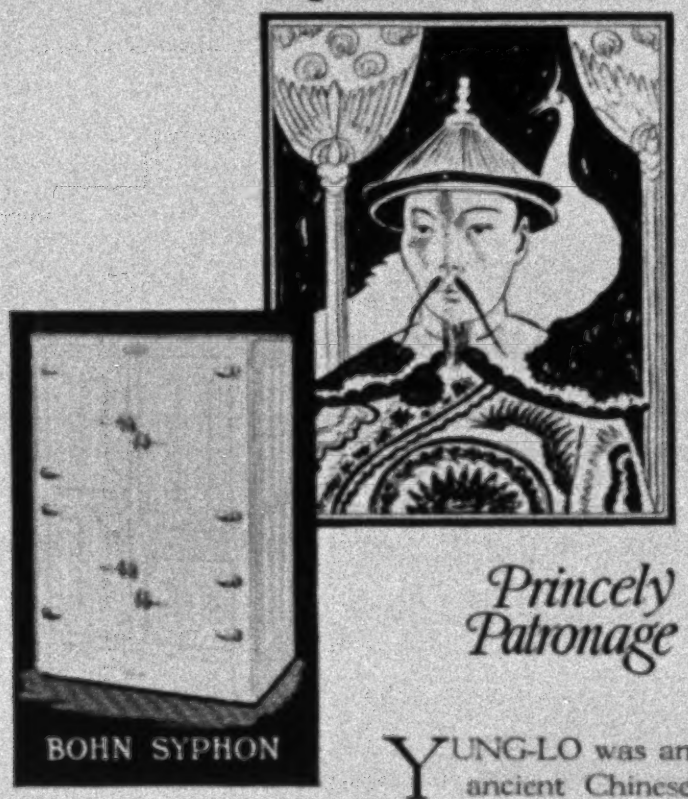

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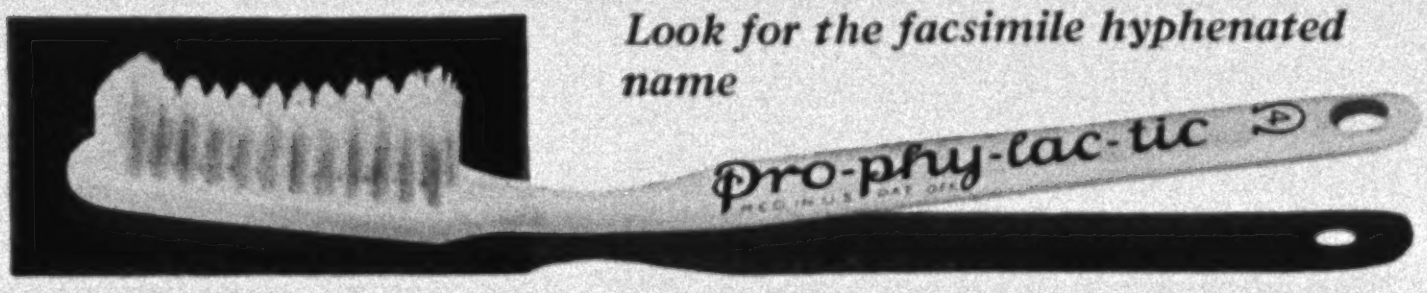

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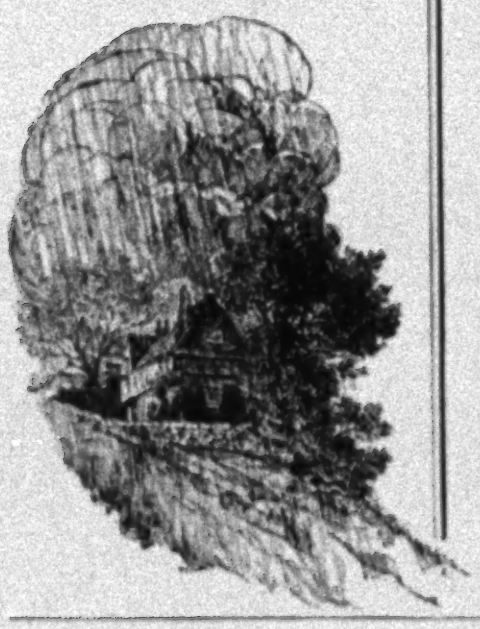

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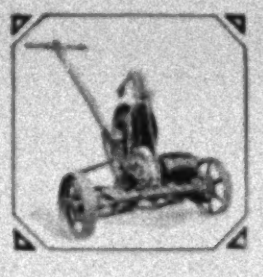

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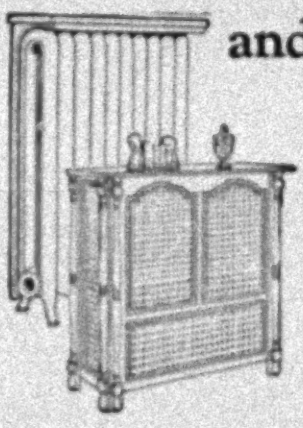

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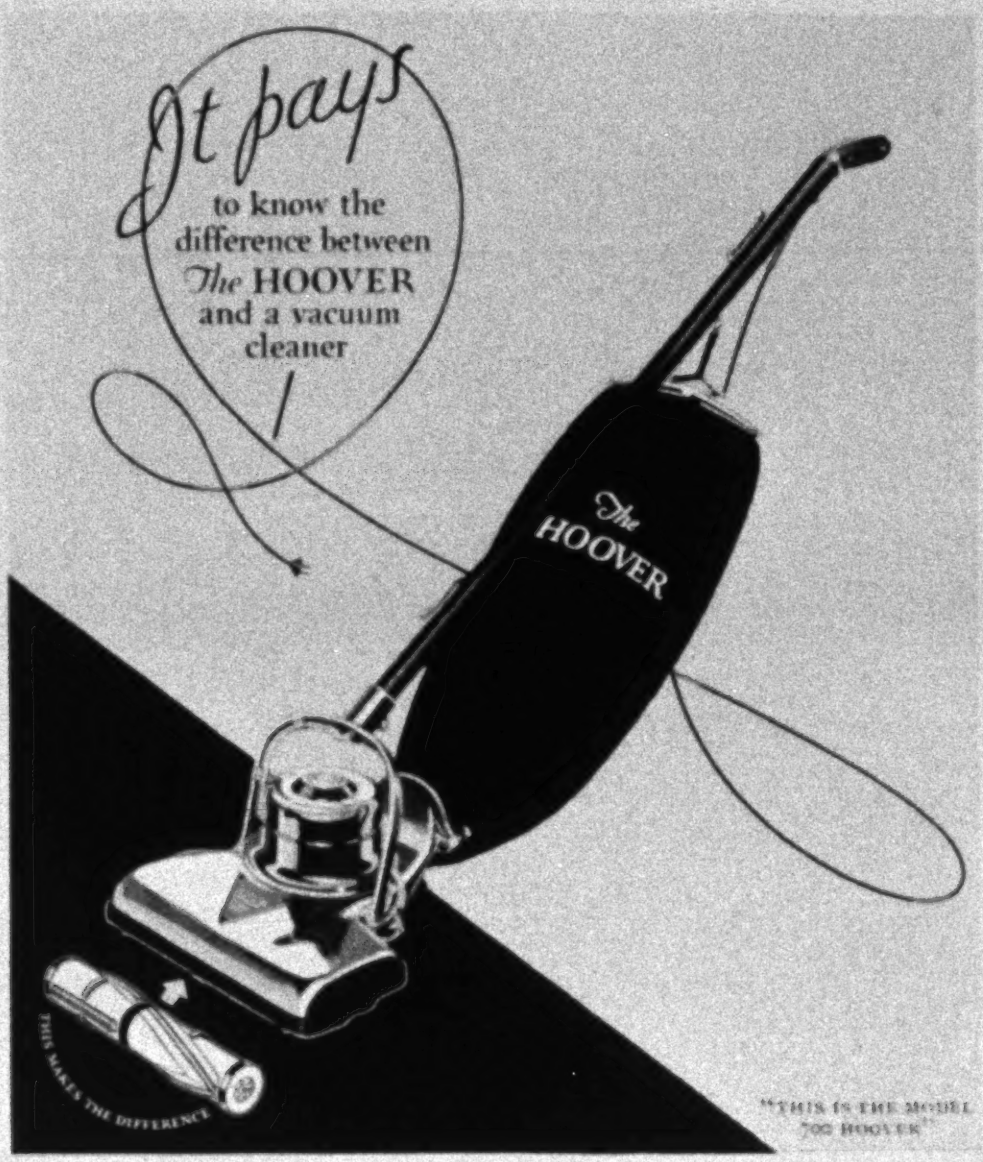

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